Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 1

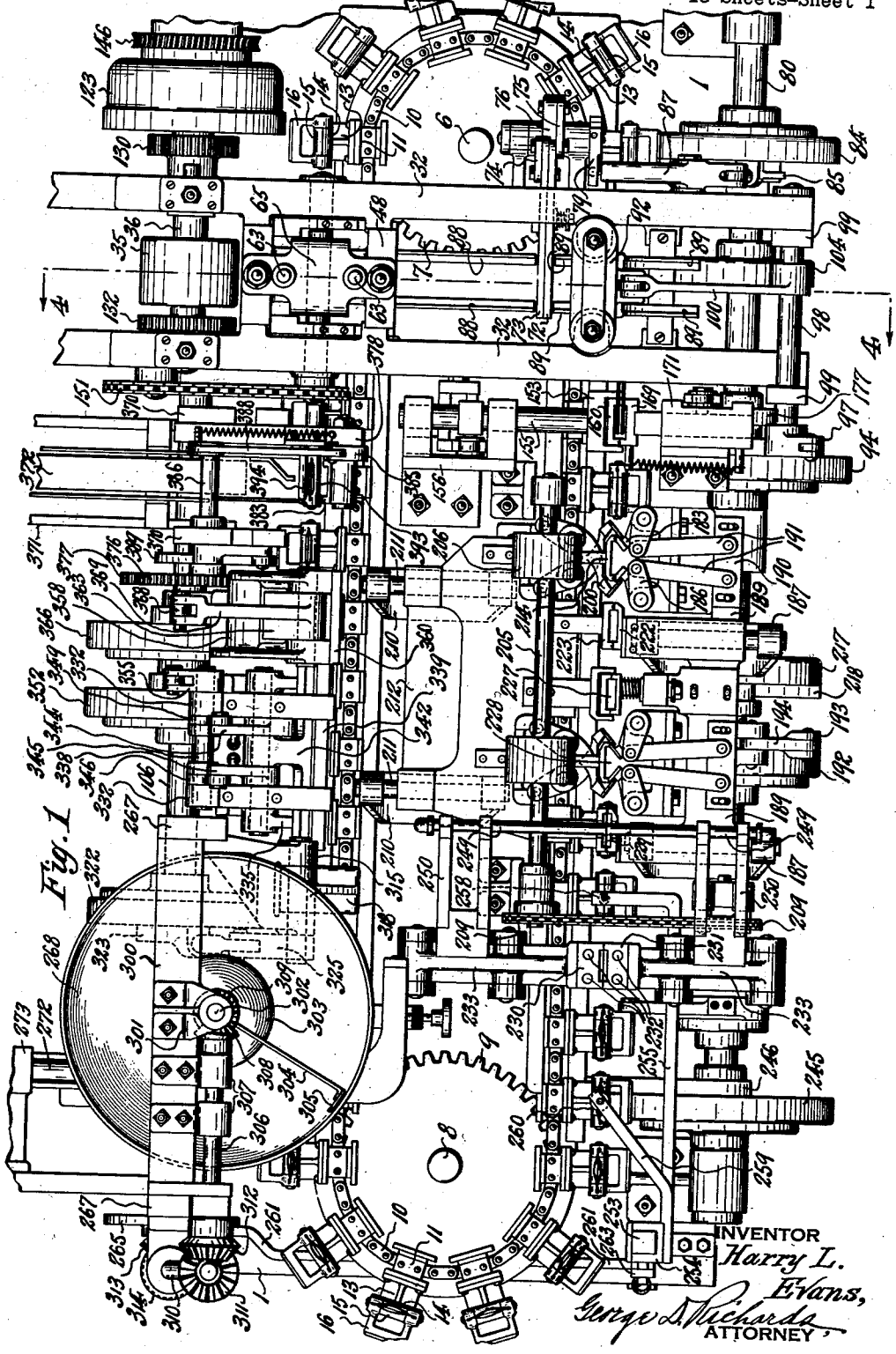

Fig. 1

INVENTOR
Harry L. Evans,
George A. Richards
ATTORNEY

Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 2

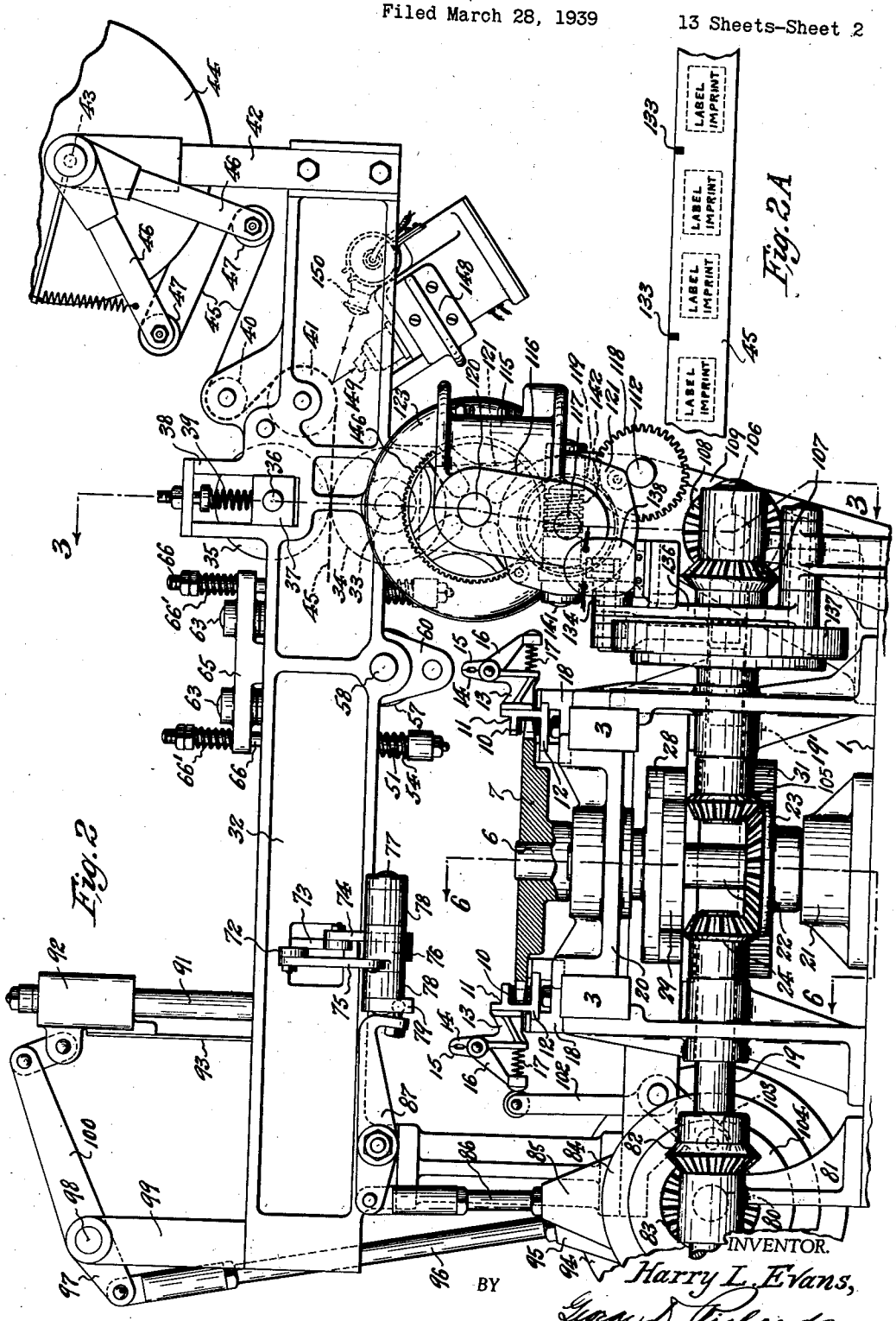

Fig. 2A

Fig. 2

INVENTOR.
Harry L. Evans,
BY
George S. Richards
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Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 3

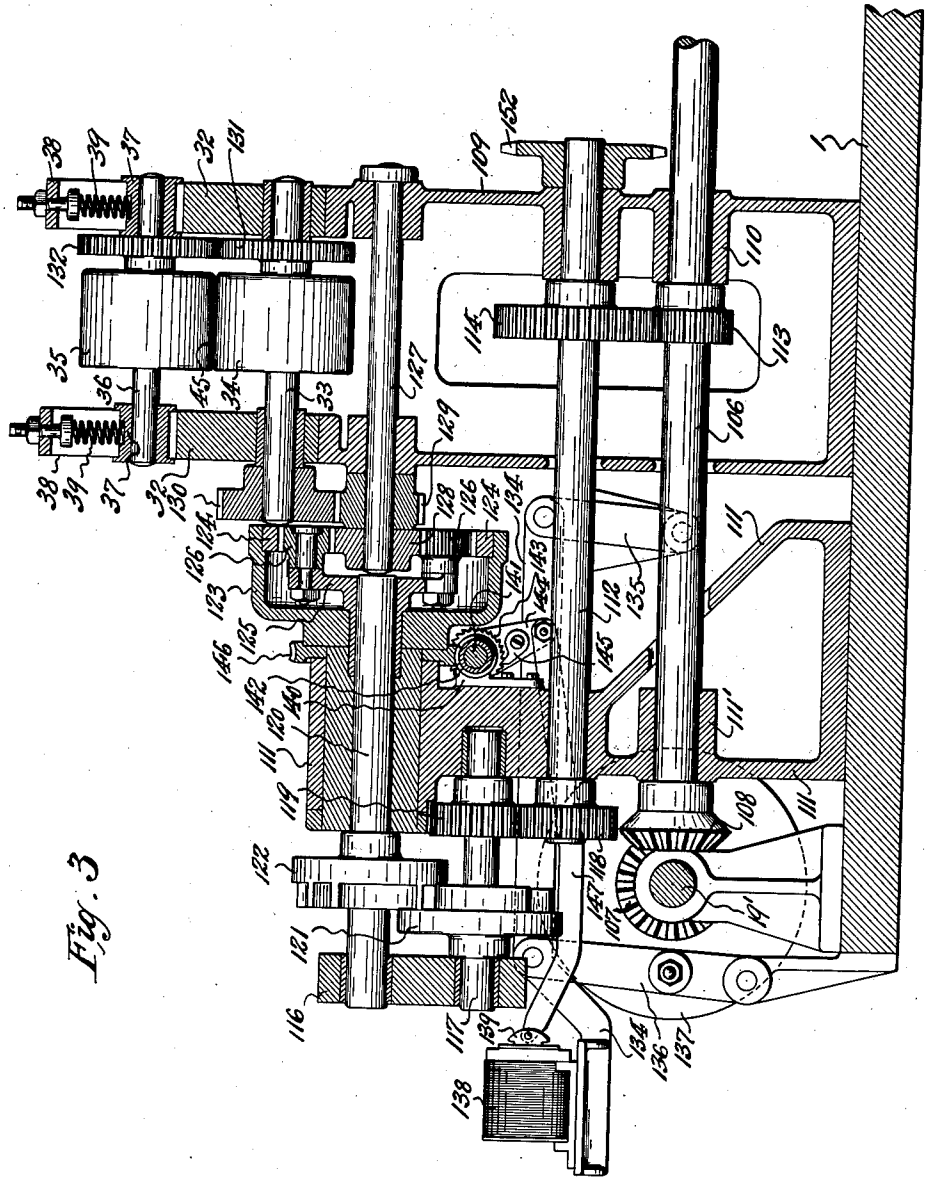

Fig. 3

INVENTOR.
Harry L. Evans,
BY Gregg & Richards
ATTORNEY.

Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 4

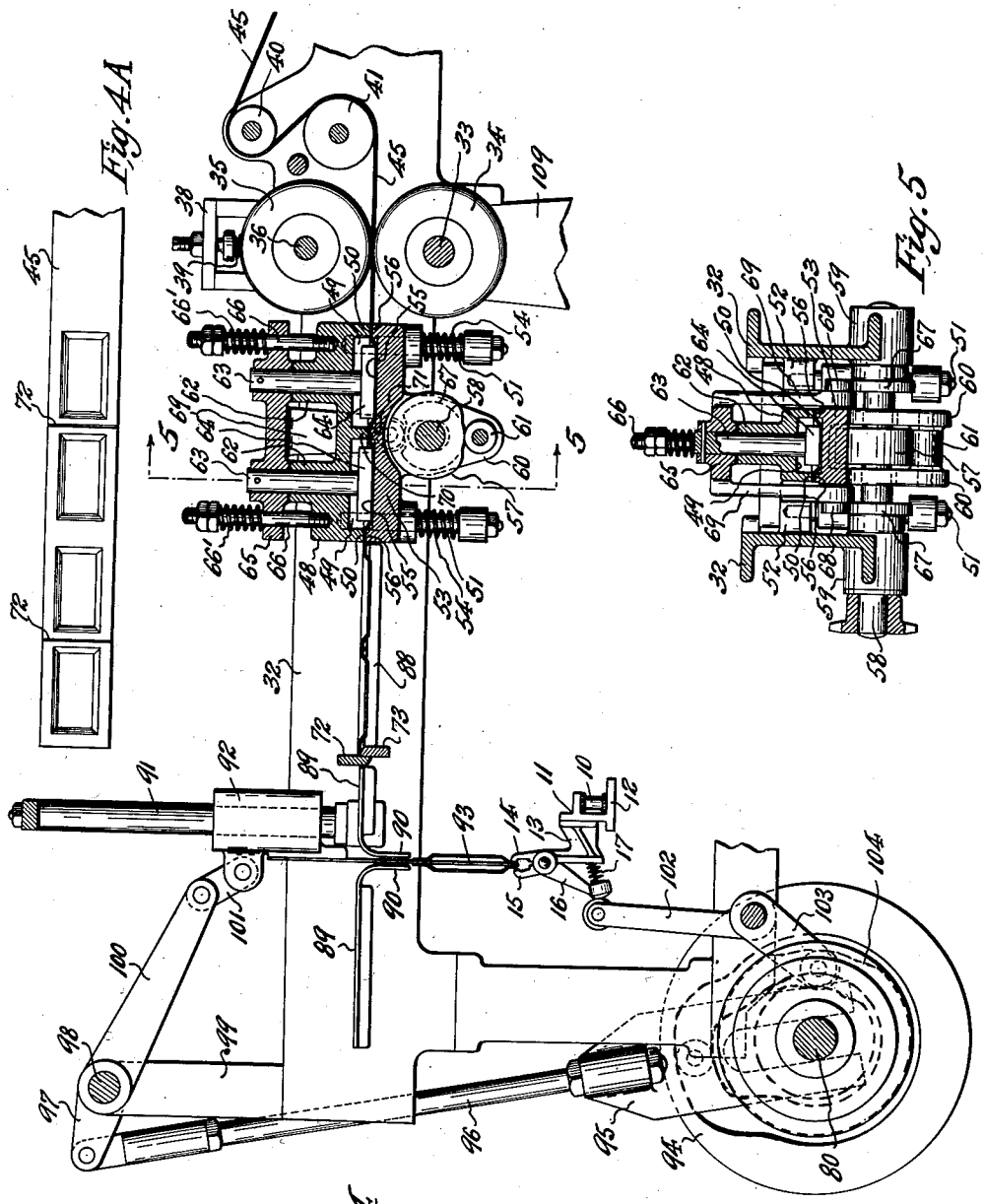

Fig. 4A

Fig. 5

Fig. 4

INVENTOR.
Harry L. Evans,
BY George D. Richards
ATTORNEY.

Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 5

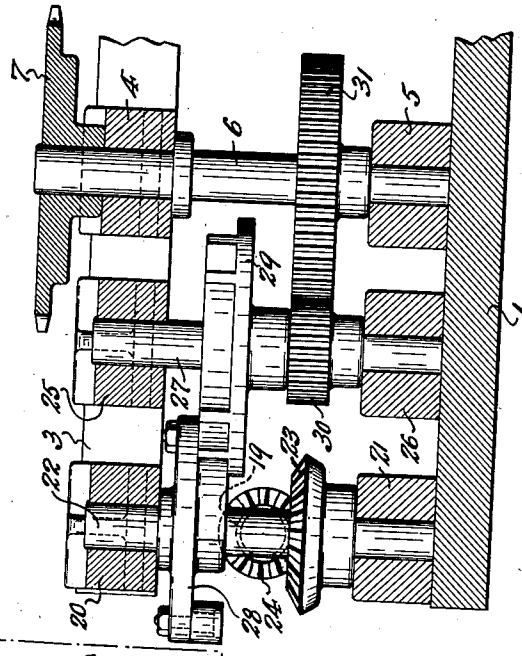

Fig. 7

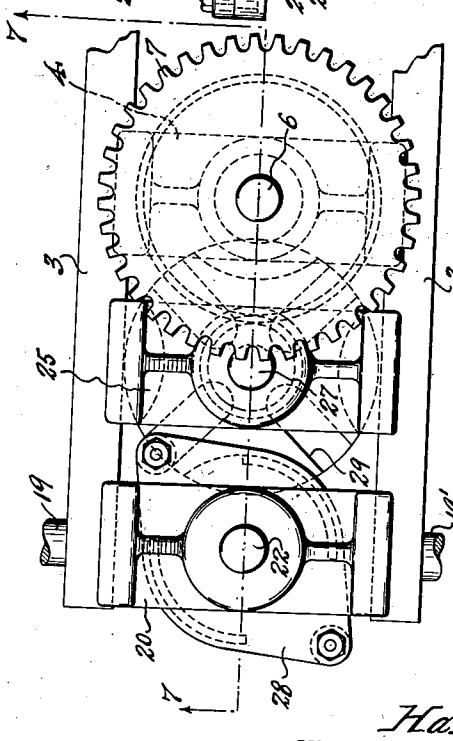

Fig. 6

INVENTOR.
Harry L. Evans,
BY George D. Richards
ATTORNEY.

Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 6

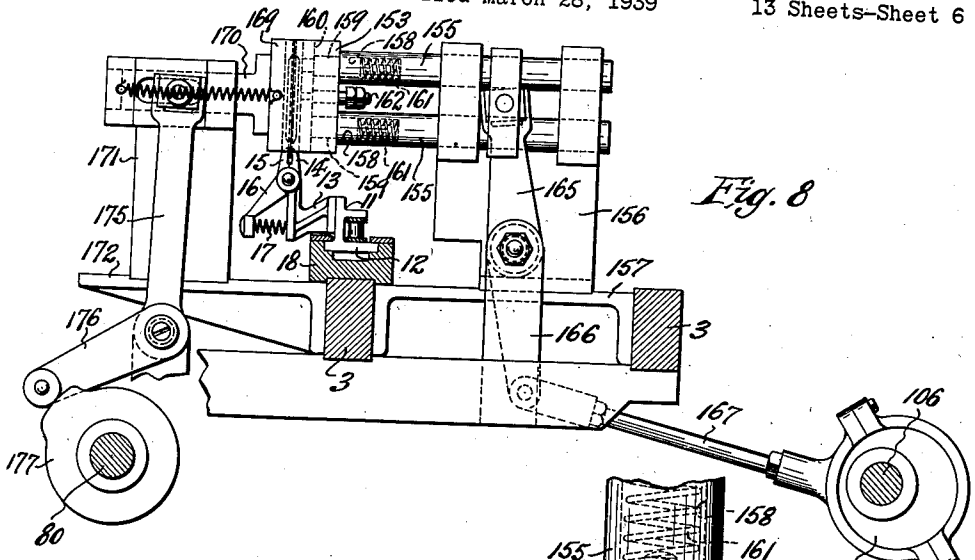

Fig. 8

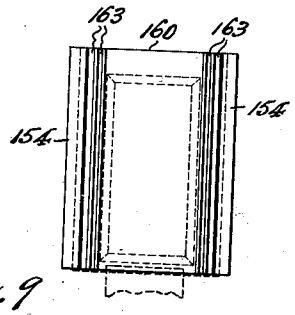

Fig. 9

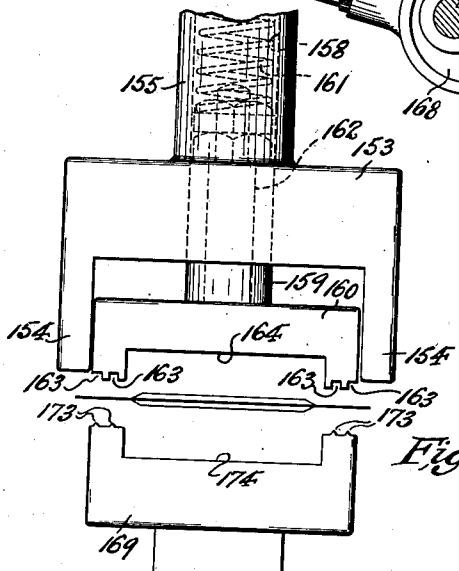

Fig. 10

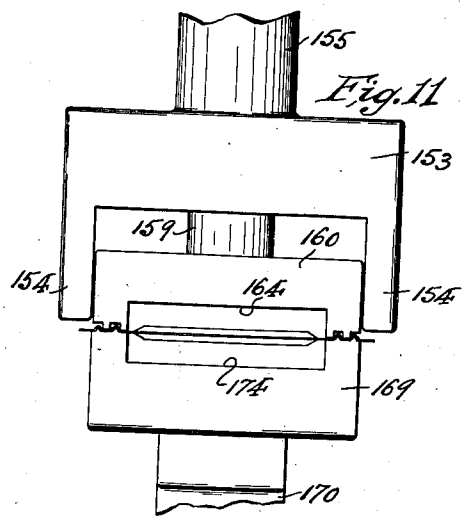

Fig. 11

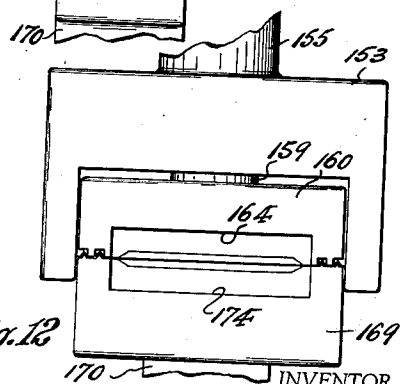

Fig. 12

INVENTOR.
Harry L. Evans,
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Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 7

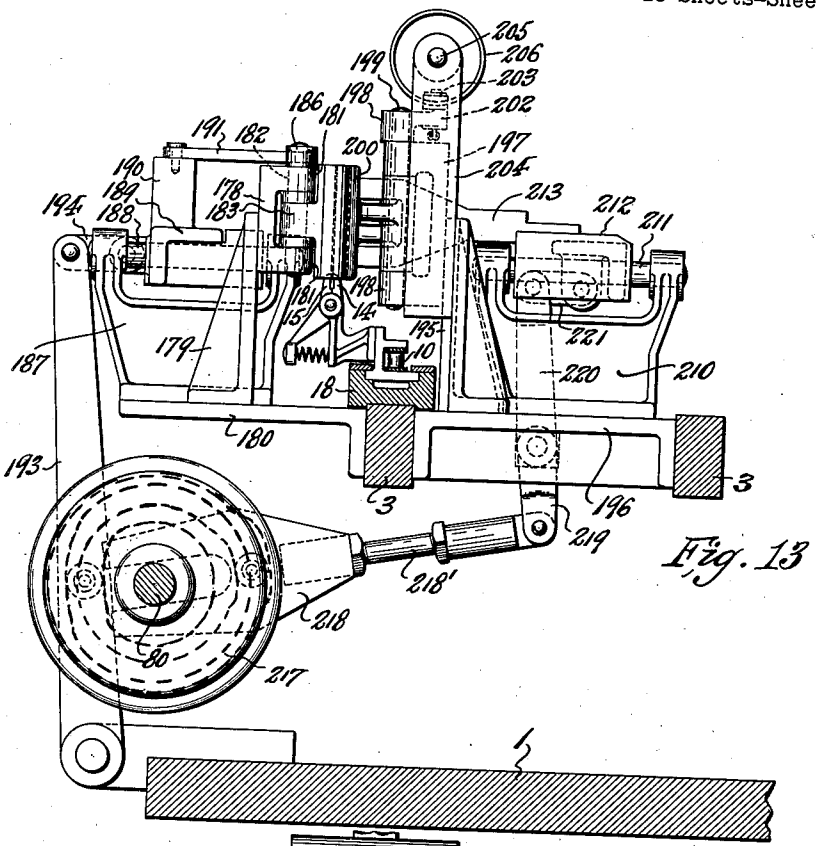

Fig. 13

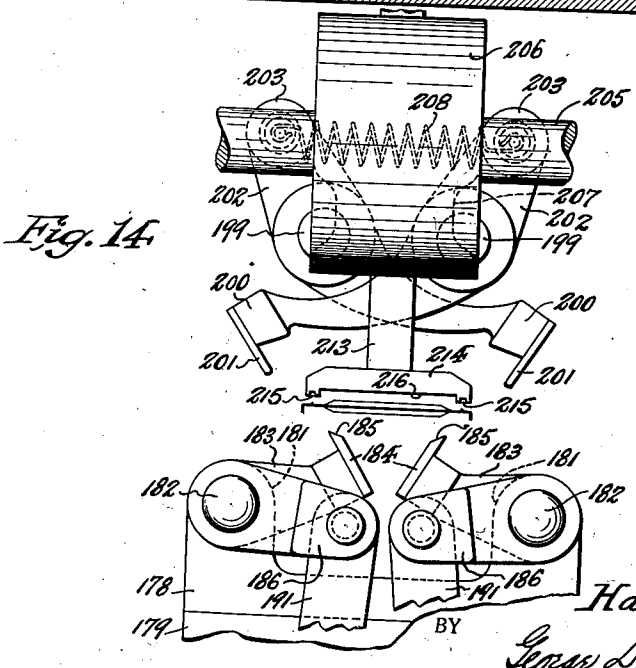

Fig. 14.

INVENTOR.
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BY
George D. Richards
ATTORNEY.

Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 8

Fig. 15

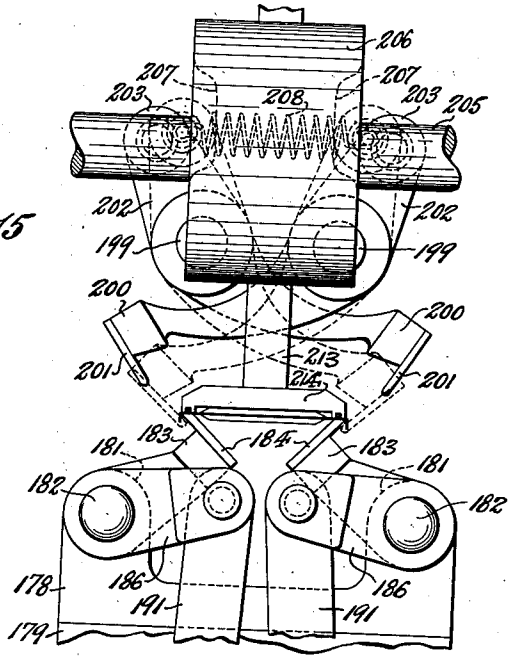

Fig. 16

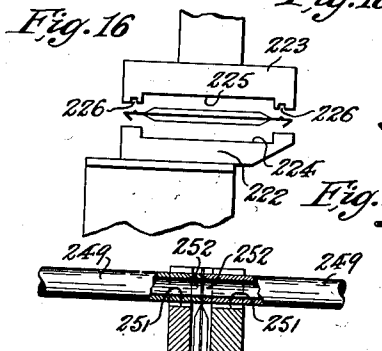

Fig. 18

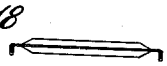

Fig. 19

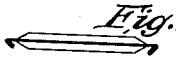

Fig. 20

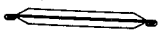

Fig. 17

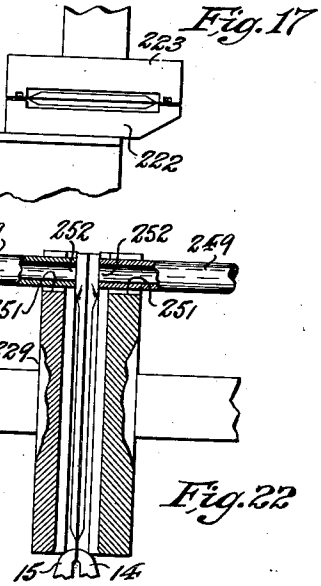

Fig. 21

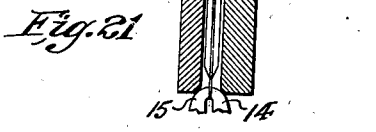

Fig. 22

INVENTOR.
Harry L. Evans,
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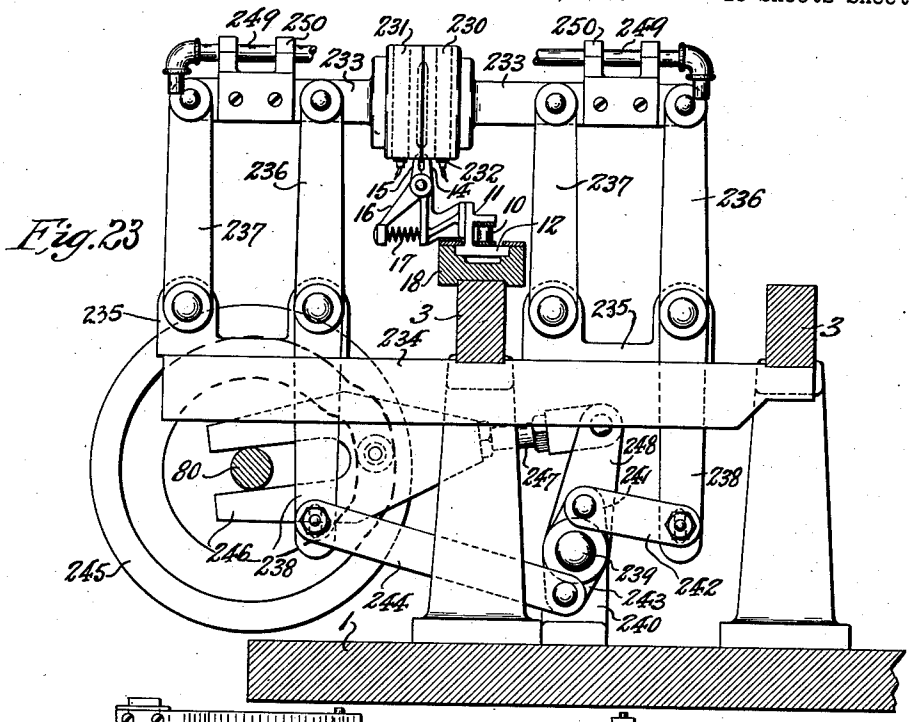
Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 9

Fig. 23



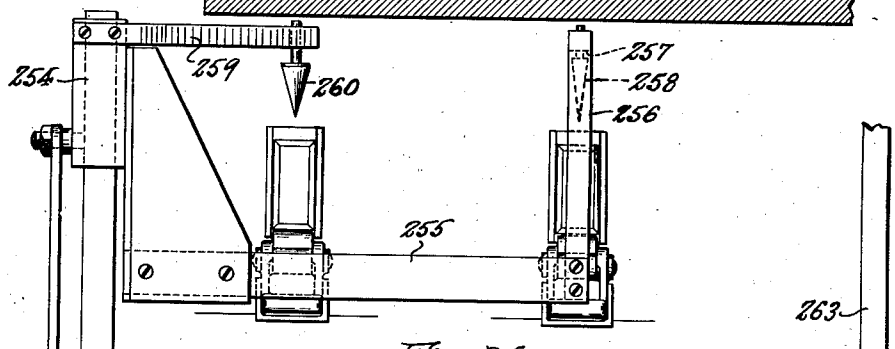


Fig. 24

Fig. 25

INVENTOR.

BY Harry L. Evans,

George D. Richards

ATTORNEY.

Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 10

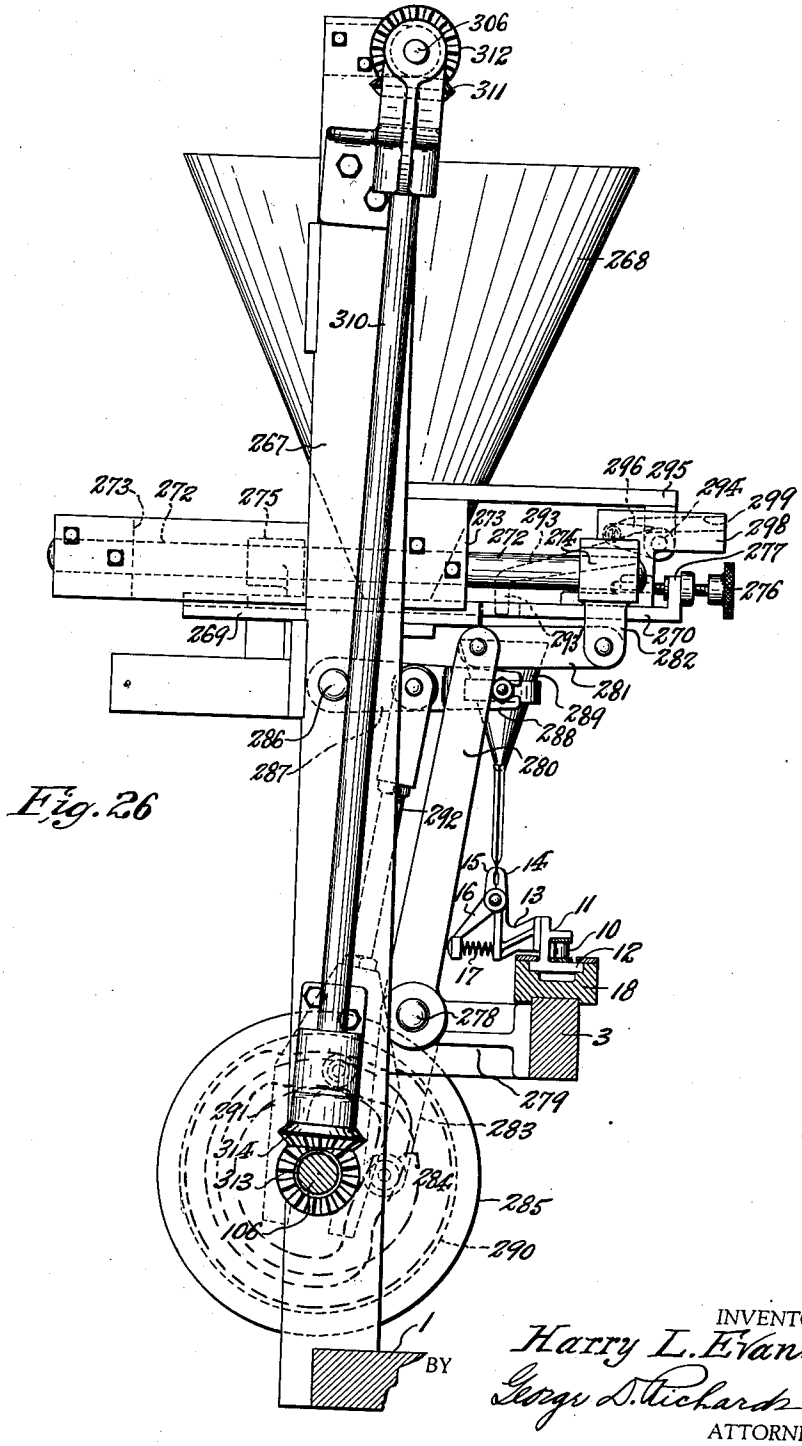


Fig. 26

INVENTOR.
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Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 11

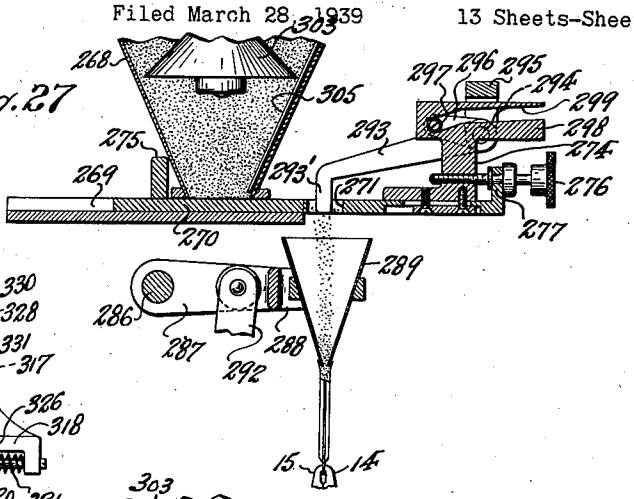

Fig. 27

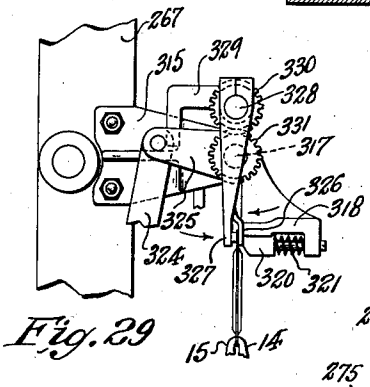

Fig. 29

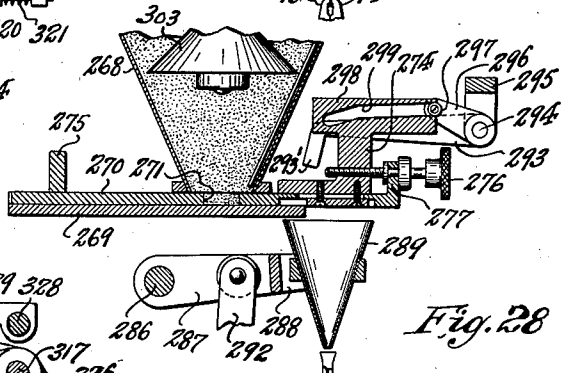

Fig. 28

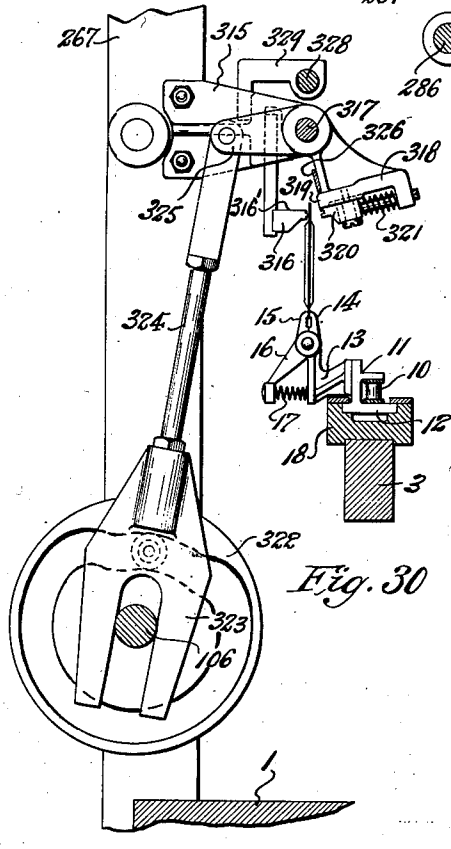

Fig. 30

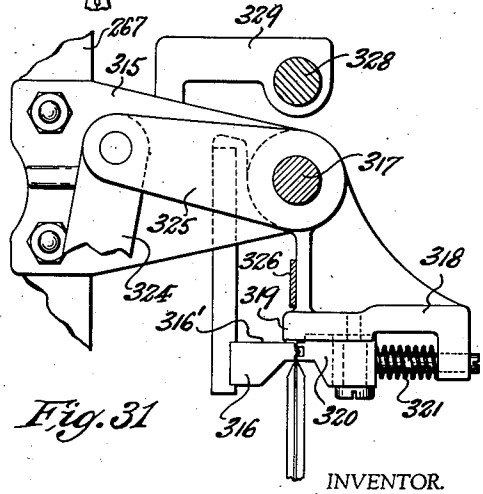

Fig. 31

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Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 12

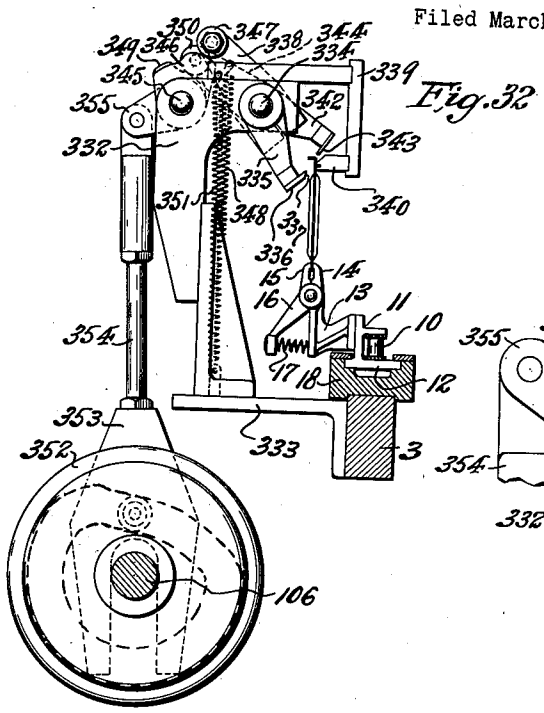

Fig. 32

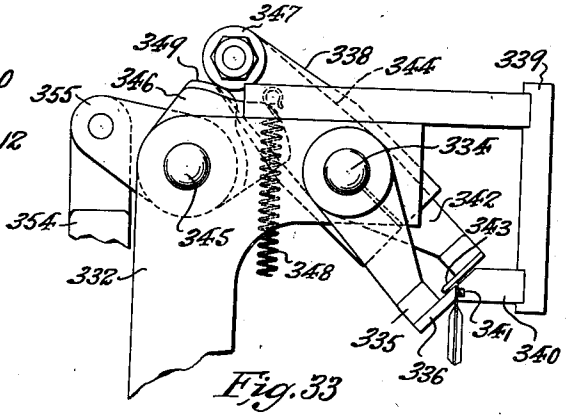

Fig. 33

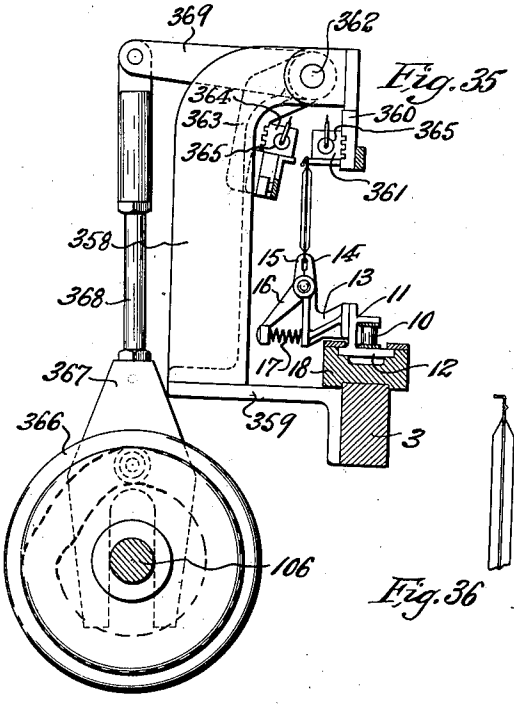

Fig. 35

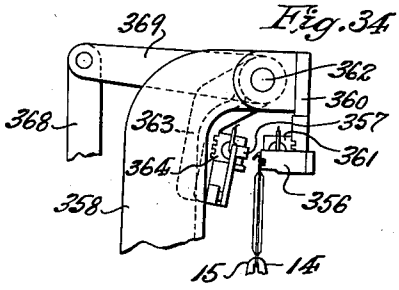

Fig. 34

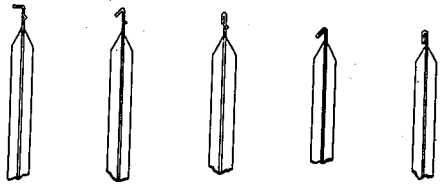

Fig. 36 Fig. 37 Fig. 38 Fig. 39 Fig. 40

INVENTOR.
Harry L. Evans,
BY
George D. Richards
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Oct. 14, 1941. H. L. EVANS 2,259,302

PACKAGE MAKING AND FILLING MACHINE

Filed March 28, 1939 13 Sheets-Sheet 13

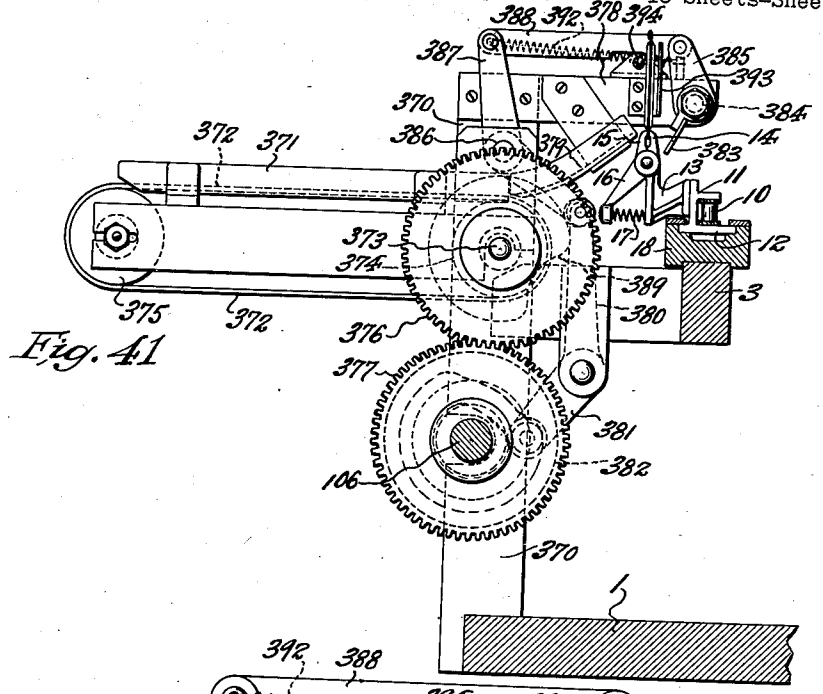

Fig. 41

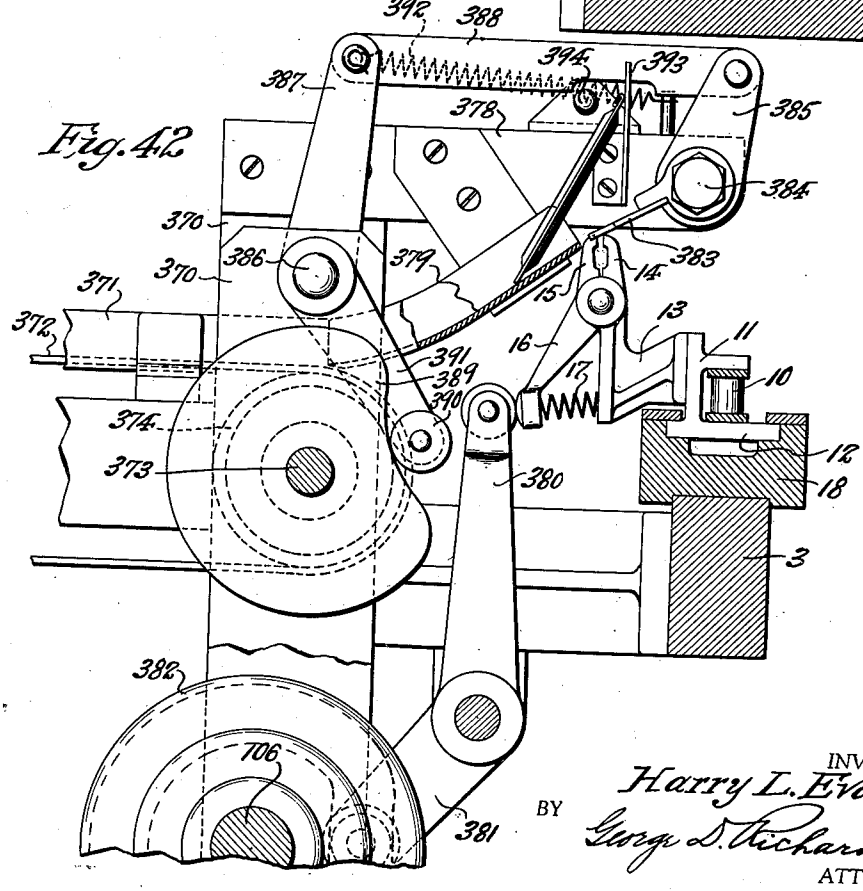

Fig. 42

INVENTOR.
Harry L. Evans,
BY George D. Richards
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Patented Oct. 14, 1941 2,259,302

UNITED STATES PATENT OFFICE

2,259,302

PACKAGE MAKING AND FILLING MACHINE

Harry L. Evans, Newport, R. I., assignor to United States Automatic Box Machinery Co., Inc., Roslindale, Mass., a corporation of Massachusetts

Application March 28, 1939, Serial No. 264,553

20 Claims. (Cl. 93—3)

This invention relates to automatic package making and filling machinery.

The invention has for its general object to provide a novel fully automatic machine adapted to form packages from sheet material, and more particularly from metallic foil, then fill the same with material to be enclosed therein, and then, after closing the filled packages, to discharge the same from the machine.

The invention has for a further object to provide, in a machine for the purposes stated, an endless conveyer mechanism having a train of gripper devices to receive and hold the sheet material from which the packages are to be formed subject to successive forming and filling operations by coordinated mechanisms mounted along the path of movement of the conveyer mechanism, together with means for automatically delivering the sheet material to the gripper devices of said conveyer mechanism.

The invention has for another object to provide novel mechanism for feeding sheet material from a supply roll thereof, including means for preforming the same to desired package body shape, severing the same into suitable package forming lengths, and then folding said lengths into initial package body formation and simultaneously delivering such body formations to the gripper devices of the conveyer mechanism subject to final forming and filling operations.

The invention has for another object to provide, in combination with the sheet material feeding mechanism, novel means for automatically controlling the feeding movement of such material when pre-printed with spaced label imprints in a manner calculated to assure accurate register of said imprints on the formed package body faces.

Other objects of the invention are to provide, at successive stations along the path of the conveyer mechanism, means for forming package closure seams, and means for sealing said seams so as to produce a substantially air and moisture proof package.

Other objects of this invention, not at this time more particularly enumerated, will be understood from the following detailed description of the invention.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which:

Fig. 1 is a plan view of the machine according to this invention, parts of the sheet material feed driving and control mechanism and of the conveyer drive mechanism being broken away.

Fig. 2 is an end elevation of the machine on a slightly enlarged scale, the same showing the sheet material feed driving and control mechanism and the conveyer drive mechanism; and Fig. 2A is a fragmentary plan view of the sheet material as pre-printed with spaced label imprints and control patches.

Fig. 3 is a vertical sectional view, taken on line 3—3 in Fig. 2.

Fig. 4 is a vertical sectional view, taken on line 4—4 in Fig. 1, but drawn on a slightly enlarged scale.

Fig. 4A is a fragmentary plan view of the sheet material after submission to the package body shape preforming means.

Fig. 5 is a transverse vertical sectional view through the sheet material preforming means, taken on line 5—5 in Fig. 4.

Fig. 6 is a vertical sectional view through the conveyer drive mechanism, taken on line 6—6 in Fig. 2; and Fig. 7 is another vertical sectional view thereof, taken on line 7—7 in Fig. 6.

Fig. 8 is a fragmentary sectional view showing the package side seam scoring means in side elevation; Fig. 9 is an enlarged face view of the female elements of the scoring means; Fig. 10 is a further enlarged plan view of the package side seam scoring blocks in normal initial position; and Figs. 11 and 12 are respectively views similar to that of Fig. 10 showing successive operative positions of said scoring blocks.

Fig. 13 is a fragmentary sectional view showing package side seam folding means in side elevation; Fig. 14 is an enlarged fragmentary plan view of package side seam folding means in normal initial condition; and Fig. 15 is a view similar to that of Fig. 14, but showing operative conditions of package side seam folding means.

Fig. 16 is a fragmentary enlarged plan view of seam lap pressing blocks in normal initial condition; and Fig. 17 is a similar view showing said pressing blocks in operative positions.

Figs. 18, 19, and 20 are respectively end views of the package illustrating successive operations in the formation of double lap side seams thereof.

Figs. 21 and 22 are enlarged vertical sectional views through seam lap pressing blocks with which are cooperatively associated suction means for somewhat expanding the open end or mouth of a formed package.

Fig. 23 is a fragmentary sectional view showing package side seam sealing mechanism in side elevation.

Fig. 24 is a fragmentary elevational view showing means for expanding the mouths of formed packages prior to filling the same; and Fig. 25

is another view of the same, looking from left to right in Fig. 24, but with parts broken away.

Fig. 26 is a framentary sectional view showing the package filling mechanism in side elevation; and Figs. 27 and 28 are fragmentary vertical sectional views illustrating stages in the operations of said package filling mechanism.

Fig. 29 is a fragmentary elevational view showing means for contracting the mouth of a filled package preparatory to the formation of the end closure seam for closing said package mouth.

Fig. 30 is a fragmentary sectional view showing the package and seam scoring means in side elevation and in normal initial condition; and Fig. 31 is an enlarged similar fragmentary view showing the operative condition thereof.

Fig. 32 is a fragmentary sectional view showing package end seam folding means in side elevation and in normal initial position; and Fig. 33 is an enlarged similar fragmentary view showing the operative condition thereof.

Fig. 34 is a fragmentary elevational view showing a first end seam lap presser means.

Fig. 35 is a fragmentary sectional view showing the means for completing and heat sealing the package end seam.

Figs. 36 to 40 inclusive are respectively side edge elevational views of a package showing various steps in the formation of a double lap end closure seam therefor.

Fig. 41 is a fragmentary sectional view showing the package discharge mechanism of the machine in side elevation and in normal initial condition; and Fig. 42 is an enlarged similar fragmentary view showing the operative condition of said package discharge mechanism.

Similar characters of reference are employed in the above described views, to indicate corresponding parts.

The various cooperating mechanisms making up the machine embodying this invention are mounted upon a horizontal bed-plate 1, and said bed-plate is in turn supported by suitable leg frame structure (not shown).

The conveyor mechanism and driving means therefor

Supported from said bed-plate 1, by standards 2, are a pair of parallel laterally spaced longitudinally extending rails 3. Affixed to and extending between said rails 3, in a position adjacent to one end of the machine, is a bearing bridge 4, the vertical bearing portion of which is centrally located between said rails and aligned over a bearing block 5 which is mounted on said bed-plate 1 (see Figs. 6 and 7). Journaled in and between said bearing bridge 4 and bearing block 5 is a vertical driven shaft 6, upon the upper end of which is affixed a conveyor drive sprocket 7. Similarly mounted at the opposite end of the machine is a vertical idler shaft 8, upon the upper end of which is arranged a conveyer idler sprocket 9. Running over and between said sprockets 7 and 9 is an endless conveyer chain 10. Said conveyer chain is arranged to move in horizontal plane and in a clockwise direction. Carried by said conveyer chain are a plurality of equi-spaced gripper devices adapted to receive and hold sheet material from which packages are to be formed. Each such gripper device comprises a carriage member 11 which is suitably affixed to the conveyer chain 10, and which is provided at its bottom with a slide shoe 12. Affixed to said carriage member 11 is an outwardly offset bracket 13 provided with an upstanding stationary gripper jaw 14. Pivotally connected with said offset bracket 13 is an upstanding movable gripper jaw 15 to cooperate with said stationary gripper jaw 14. Said movable gripper jaw 15 is provided with a downwardly and outwardly extending lever means 16 for actuating the same. Compression spring means 17 is arranged between said bracket 13 and lever means 16, and is effective to yieldably urge said lever means 16 to normal outwardly swung disposition operative to hold said movable gripper jaw 15 in closed relation to said stationary gripper jaw 14. Mounted on said rails 3 are channeled slideway members 18 through which the slide shoes 12 of the gripper carriage members 11 move, when the same accompany the straight courses of the conveyer chain running between the sprockets 7 and 9.

Drive mechanism is provided for actuating the conveyer mechanism with an intermittent motion adapted to cause the gripper devices carried thereby to progressively advance and periodically dwell at successive stations along the circuit of the conveyer where the various package forming, filling and closing operations are to be carried on. An illustrative form of driving transmission suitable for this purpose, as shown (see Figs. 2, 6 and 7), comprises, a suitably supported transverse drive shaft 19 located at the end of the machine adjacent to which the conveyer drive sprocket 7 is disposed. This drive shaft 19 is continuously driven from any suitable source of power and through the agency of a suitable power transmission means (not shown). Affixed to and extending between the rails 3, outwardly of the drive sprocket 7 and its shaft 6, is a bearing bridge 20, the central vertical bearing portion of which is aligned over a bearing block 21 which is mounted on said bed-plate 1. Journaled in and between said bearing bridge 20 and bearing block 21 is a vertical shaft 22 upon which is fixed a bevel gear 23. Fixed on said drive shaft 19 is a pinion 24 which meshes with and drives said bevel gear 23, and thus the shaft 22. Also affixed to and extending between the rails 3, between the bearing supports of the drive sprocket shaft 6 and the vertical shaft 22, is another bearing bridge 25, the central vertical bearing portion of which is aligned over a bearing block 26 which is affixed to the bed-plate 1. Journaled in and between said bearing bridge 25 and bearing block 26 is a vertical countershaft 27. Operative between the vertical shaft 22 and the countershaft 27 is a Geneva gearing, comprising the male Geneva gear 28 which is affixed to shaft 22, and the female Geneva gear 29 which is affixed to the countershaft 27. Operative between the countershaft 27 and the drive sprocket shaft 6 is transmission gearing, comprising a drive gear 30 on said countershaft 27 which meshes with a driven gear 31 on said drive sprocket shaft 6.

Sheet material delivery means

Supported above and extending transversely across the driven end of the conveyer mechanism is the means for feeding and initially preparing, folding and delivering the sheet material, from which the packages are to be formed, to the gripper devices of said conveyer mechanism. An illustrative form of this sheet material delivery means, as shown (see Figs. 1, 2, 3, 4 and 5), comprises framework providing a pair of suitably supported laterally spaced and parallel

frame members 32. Journaled in and between said frame members 32, adjacent to the right hand end of the framework as shown in Figs. 2 and 4, is a cross shaft 33 upon which is mounted one feed roller 34 of a pair thereof, the other feed roller 35 of said pair being mounted on a parallel cross shaft 36 which is mounted in bearings 37 vertically movable in housing means 38 with which the frame members 32 are provided, and so as to be urged by spring means 39 in such manner as to yieldably thrust said feed roller 35 toward and into cooperative relation to the feed roller 34. Also mounted on and between said frame members 32, in advance of said feed rollers 34—35, are suitably disposed sheet material idler guide rollers 40 and 41.

Affixed to and upstanding from said framework is a standard 42 which supports a spindle 43 for rotatably mounting a reel 44 adapted to carry a supply roll of sheet material 45 from which the packages are to be made. The sheet material, employed to form the specific package which the mechanism according to this invention is especially adapted to produce, consists of metallic foil although it will be understood, that in its broader aspects, the mechanism according to this invention is adapted to work upon other kinds of sheet material as well. In hereinafter referring to the sheet material, however, it will be referred to as foil without thereby intending any unnecessary limitation.

The foil 45 is drawn off the supply roll and led over the idler guide rollers 40 and 41, to thence pass between the feed rollers 34 and 35. If desired, web tensioning means, such as the pivoted spring tensioned arms 46 and their rollers 47 may be employed in the manner and for purposes well known in the art. The feed rollers 34–35 are intermittently driven, by suitable transmission mechanism to be subsequently described, whereby the foil 45 is advanced step by step, in such manner as to measure and feed succesive lengths thereof corresponding to the length of package blank required.

Supported by and between the frame members 32, beyond the discharge side of the feed rollers 34 and 35, is means for preforming the foil, whereby desired areas thereof are stretched and drawn out by force applied perpendicular to the plane thereof, so as to produce concavo-convex sections located within and intermediate its marginal limits, which, when the open sides thereof are superposed by folding the foil upon itself, provide a hollow package body of predetermined size and shape. This preforming means comprises a stationary frame or block 48 having in its under face longitudinally spaced cavities 49 of peripheral shape adapted to define the peripheral limits and outline shape desired to be given to preformed sections or areas of the foil blank from which the package is to be made. The portions of said frame or block 48 which skirt said cavities 49 provide clamp sections 50 to engage the top face of the foil registered therewith. Vertically movable on suporting rods 51, dependent from the ledges 52 with which the frame members 32 are provided, is a combined movable clamp and female stretcher block 53, which is yieldably urged by compression springs 54 toward said stationary frame or block 48. Said block 53 is provided in its top face with spaced cavities 55 constituting female stretcher means. Said cavities 55 correspond in peripheral shape to the peripheral shapes of the stationary frame or block cavities 49, and thus also to the peripheral limits and outline shape desired to be given to the preformed sections or areas of the foil blank. The portions of said clamp and stretcher block 53 which skirt its cavities 55 provide clamp sections 56 to engage the bottom face of the foil registered therewith, and so as to cooperate with the clamp sections 50 of the stationary frame or block 48. The timed operation of said clamp and stretcher block 53 is controlled by a rotatable cam 57 carried by a driven shaft 58. Said shaft 58 is journaled in and between bearings 59 carried by said frame members 32. Said clamp and stretcher block 53 is provided with dependent slotted arms 60 through which the shaft 58 extends, and between the free ends of which is mounted an anti-friction roller 61 for cooperation with said cam 57. Provided in connection with the stationary frame or block 48, perpendicular to its cavities 49, are guideway means 62 to slidably support plunger rods 63, upon the lower ends of which are affixed male stretcher members 64. Said stretcher members 64 respectively lie within the cavities 49, and, while substantially conforming in peripheral shape to the peripheral shapes of said cavities 49 and of the corresponding cavities 55 of the clamp and stretcher block 53, are of less over all dimension so as to provide foil stretching clearance intermediate the peripheries thereof and the peripheries of said cavities 55 of the clamp and stretcher block 53. Said plunger rods 63 are affixed by their upper ends to a cross head 65. Said cross head 65 is perpendicularly slidable on upstanding supporting rods 66 carried by said stationary frame or block 48, and is yieldably urged downwardly by compression springs 66' which, when free to act, serve to thrust said male stretcher members 64 into operative relation to the foil desired to be stretchingly preformed. The timed operation of said male stretcher members 64 is controlled by rotatable cams 67 which are mounted on and actuated by the driven shaft 58. These cams 67 cooperate with anti-friction rollers 68 carried by arms 69 dependent from said cross head 65. Intermediate the cavities of the respective blocks 48 and 53 are cooperating transverse foil scoring means comprising a male scoring means 70 and a female scoring means 71, whereby the foil blank is transversely scored along a line intermediate the concavo-convex preformed sections thereof and about which said sections are to be subsequently folded into superposed relation.

While, by the operation of the cams 57 and 67 respectively, the clamp and female stretcher block 53 is depressed against the tension of the springs 54, and the male stretcher members 64 are raised against the tension of the springs 66', the foil 45 is advanced by the feed rollers 34—35 to deposit a blank forming length thereof subject to the preforming action of these devices. In operation, the cam 57 first operates to release the block 53 for upward movement under the thrust of the springs 54, whereby the areas of the foil marginal to the portions to be preformed are first clamped by and between the clamp sections 56 of the block 53 and the clamp sections 50 of the block 48, while at the same time the scoring means 70—71 are brought together to produce the transverse score 72 (see Fig. 4A) in the foil. When the foil is thus gripped, the cam 67 operates to release the male stretcher members 64 for downward movement under the thrust of the springs 66'. The downwardly thrust male stretcher members 64 en-

gage the underlying areas of the foil extending intermediate the cavities 49 and 55 of the blocks 48 and 53, thereby forcing the foil downwardly into the cavities 55, and thus stretching those portions of the foil extending across the clearance spaces between the peripheries of the cavities 55 and the peripheries of said male stretcher members 64, whereby the desired preformed concavo-convex package body formations are produced, after which the male stretcher members 64 and clamp and stretcher block 53 are returned to normal initial positions.

Supported by and between the frame members 32, beyond the foil preforming or package body shaping means above described, is a shear means for severing the package forming blanks from the run of foil fed from the supply roll thereof. This shear means, in one illustrative embodiment thereof, comprises a pair of pivoted shear blades 72 and 73 which are respectively operatively connected by links 74 and 75 to actuating bell-crank means 76. Said bell-crank means is fixed on a rock-shaft 77 mounted in bearings 78 connected with one of the frame members 32, and affixed to said rock-shaft is a crank-arm 79.

To effect timed actuation of said shear means, as well as other mechanisms to be subsequently described, a longitudinal lay shaft 80 is provided. This lay shaft 80 is journaled in suitably disposed bearing members 81 upstanding from said bed-plate 1, so as to dispose said lay shaft 80 parallel to the outgoing course of the conveyer mechanism. Said lay shaft 80 is driven from said drive shaft 19 by gearing comprising a bevel gear 82 on the latter shaft which meshes with a bevel gear 83 on said lay shaft. Mounted on said lay shaft 80 is a shear timing and actuating cam 84. Said cam 84 cooperates with the forked end plate 85 of a connecting rod 86, the upper end of which is connected with one arm of a pivoted lever 87. The opposite arm of said lever 87 is suitably coupled with said crank-arm 79 of the shear mechanism rock-shaft 77 so as to transmit operative motion thereto in timed relation to the intermittent feeding movement of the foil 45.

Between the foil preforming or package body shaping means and said shear means extend suitable foil supporting and guiding members 88. Beyond the shear means are located additional foil supporting and guiding members 89, which are arranged to include opposed downwardly extending foil folding and guiding portions 90, adapted to project toward and in alignment with the path of movement of the gripper devices of the conveyer mechanism.

Supported from and in upstanding relation to the frame members 32 are vertical slideway posts 91. Mounted on and between said slideway posts 91 is a vertically reciprocable cross head 92 to which is secured a plunger blade 93. The means for affecting timed reciprocation of said cross head 92 and its plunger blade 93 comprises an actuating cam 94 which is mounted on said lay shaft 80. Said cam cooperates with the forked end plate 95 of a connecting rod 96, the upper end of which is connected with a crank arm 97 fixed on a rocker shaft 98 which is journaled in bearing standards 99 upstanding from said frame members 32. Fixed on said rocker shaft 98 is a lever arm 100, the free end of which is connected by a link 101 to said cross head 92.

In operation, a length of preformed foil constituting a package forming blank, when advanced through the open shear mechanism, comes to rest on the foil supporting and guiding members 89, and so as to straddle the vertical foil folding and guiding portions 90, with its intermediate scored portion aligned beneath the normally upraised plunger blade 93. By the timed operations involved, the thus advanced length of foil is severed from the fed run of foil by the actuated shear mechanism, whereupon the plunger blade 93 is caused to descend, whereby the foil blank is folded lengthwise upon itself, as it is pushed downward between the folding and guiding portions 90 by the descending plunger blade, thereby at the same time opposing the preformed concavo-convex sections of the foil blank one to the other in package body forming relation. These foil blank folding and delivery operations are timed to occur while the conveyer mechanism is at rest so as to dispose a gripper device thereof in the path of plunger blade movement. Prior to descent of the plunger blade 93, a means for opening the awaiting gripper device is caused to function. This gripper device opening means comprises a pivoted gripper trip lever the upper arm 102 of which is disposed to engage actuating lever 16 of the movable gripper jaw 15 of said awaiting gripper device, while the lower arm 103 thereof is operatively engaged by a cam 104 which is mounted on the lay shaft 80. Said cam 104 so times the operation of the gripper trip lever so as to cause the same to open and hold open the movable gripper jaw 15 until the folded end of the foil blank is carried downwardly between the stationary gripper jaw 14 and the opened movable gripper jaw 15, whereupon the gripper trip lever is caused to return to normal initial position, so that the movable gripper jaw 15 is closed by the tension of spring 17 upon the actuating lever 16, thus engaging the folded foil blank to support the same in upstanding relation to the conveyer mechanism so as to be carried thereby. As soon as the folded blank is thus delivered to a gripper device of the conveyer mechanism, the plunger blade 93 is retracted to normal initial upraised position.

Sheet material delivery drive

One of the features of the instant invention is to provide a sheet material delivery operating or drive mechanism which is adapted to automatically control the feeding movement of the material, such as the foil 45, when pre-printed with spaced label imprints, in such manner as to assure accurate register of said imprints on the formed package body faces. An illustrative embodiment of sheet material delivery drive mechanism adapted to this end, as shown (see Figs. 2 and 3), comprises the following:

A suitably supported drive shaft extension 19' is driven from said bevel gear 23 by a pinion 105 with which said shaft extension 19' is provided. A suitably supported longitudinal lay shaft 106 is disposed parallel to the return course of the conveyer mechanism, and is driven from said drive shaft extension 19' by gearing comprising a bevel gear 107 on the latter shaft which meshes with a bevel gear 108 on said lay shaft 106. The supporting pedestal 109, which is mounted on said bed plate 1, and by which the frame members 32 of the sheet delivery mechanism is in part supported, includes a bearing portion 110 for said lay shaft 106, and outwardly of said supporting pedestal 109 is a bearing frame 111, which likewise includes a bearing portion 111' for said lay shaft 106. Journaled in

and between said supporting pedestal 109 and said bearing frame 111, above said lay shaft 106, is a countershaft 112. This countershaft 112 is driven from the lay shaft 106 by a gear 113 on the latter which meshes with and drives a gear 114 on the former. Said bearing frame 111 includes, in connection with its upper end portion, a bearing bracket member 115 having a bearing portion 116 outwardly offset relative to the upper end portion of said bearing frame 111. Journaled in and between said offset bearing portion 116 and said bearing frame 111 is a Geneva drive shaft 117, which is driven from said countershaft 112 by a gear 118 on the latter which meshes with and drives a gear 119 on the former. Also journaled in and between said offset bearing portion 116 and said bearing frame 111 is a Geneva driven shaft 120, which is disposed above said Geneva drive shaft 117. Fixed on said Geneva drive shaft 117 is a male Geneva gear 121 which cooperates with a female Geneva gear 122 fixed on said Geneva driven shaft 120.

Supported by said bearing frame 111 is a planetary gear set having a drum or casing 123 provided with an internal or ring gear 124. Fixed on and driven by the inner end of said Geneva driven shaft 120 is a planet gear frame 125 which carries a series of rotatable planet gears 126 adapted to mesh with said internal or ring gear 124 of the drum or casing 123. Journaled in the supporting pedestal 109, so as to be disposed in axial alignment with said Geneva driven shaft 120, is the foil feed roller drive shaft 127, upon which is fixed a drive gear 128 arranged to mesh with said planet gears 126. The cross shaft 33 of the lower feed roller 34 is driven from said drive shaft 127 by a gear 129 affixed to the latter, and which meshes with a gear 130 affixed to the former. Preferably the cross shaft 36 of the upper feed roller 35 is driven from the cross shaft 33 of the lower feed roller 34 by a gear 131 affixed to the latter, and which meshes with a gear 132 affixed to the former.

When the foil, from which the package forming blanks are produced, is pre-printed with spaced label or other imprints, as e. g. shown in Fig. 2A, and which are required to be precisely positioned on one or more faces of the completed package, it is necessary to so control the operation of the feed rollers 34—35 that the lengths of foil advanced to provide the package blanks will each contain the imprints so disposed thereon as to be certain of occupying the desired location on the face or faces of the completed packages. To attain such control, the major or approximate foil advancing movement of the feed rollers 34—35 is both timed and controlled by the Geneva gearing 121—122, whereby a length of foil 45 slightly less than required to furnish a package blank is fed to the preforming or package body shaping means, whereupon a special auxiliary feed roller drive means becomes effective to complete the advance of the foil to that extent and position which will assure the required accurate register of the label imprints on the ultimate package face or faces. This auxiliary feed roller drive means includes electric clutch means adapted to be controlled by an electric eye device for scanning the advancing foil, the latter being additionally provided with pre-printed and accurately spaced detector spots or patches 133 (see Fig. 2A), which are co-operative with said electric eye device and a light source operative therewith.

Said auxiliary feed roller drive means comprises a reciprocable bar 134 mounted upon pivoted rocker arms 135 and 136, one of which, as e. g. the rocker arm 136 is subject to timed actuation by an operating cam 137 which is affixed on the drive shaft extension 19'. Carried by said reciprocable bar 134 is an electric solenoid 138 having an armature 139. Rotatably journaled in bearing bracket supports 140 is the shaft 141 of a drive worm 142, and fixed on said shaft 141 is a ratchet wheel 143. Pivotally mounted on said shaft 141, as a fulcrum, is an oscillatable lever 144 carrying a pawl 145 adapted to engage said ratchet wheel 143. Affixed to said drum or casing 123 of said planetary gear set is a worm gear 146 which meshes with and is driven by said worm 142. Interconnecting said lever 144 and the armature 139 of said solenoid is a link 147.

Supported by a suitable bracket frame 148 carried by the frame members 32 is an electric eye device 149 and also carried by said bracket frame is a light source 150 cooperative with said electric eye device (see Fig. 2). Said electric eye device 149 is directed toward the foil 45 where the same passes over and around the idler guide roller 41. The light from said light source 150 is likewise directed toward the foil 45 in such angular relation thereto as to be reflected therefrom to said electric eye device 149, and so as to strike those areas of the foil 45 which bear and are aligned with the detector spots or patches 133 borne by said foil. Through proper electrical connections and relays (not shown) said electric eye device 149 is electrically related to the windings of said solenoid 138 so as to control the energizing and deenergizing thereof.

In the operation of the foil delivery drive mechanism, the Geneva gearing 121—122 transmits to the shaft 120 a properly timed rotative movement which revolves the planet gear frame 125 and planet gears 126 carried thereby relative to the drum or casing 123 and ring gear 124 of the planetary gear set. Since, during the period of power transmission by said Geneva gearing 121—122, the drum or casing 123 and ring gear 124 are held stationary by the then inactive worm and worm gear 142 and 146, the revolution of the planet gears 126 around the stationary ring gear 124 produces a rotation of the former about their axes. The rotary movement of the planet gears 126 is transmitted to the drive gear 128, whereby a major feeding movement is in turn transmitted to the foil feed rollers 34—35. This major feeding movement of the feed rollers operates to draw a length of foil off of the supply roll approximating that required to supply a package forming blank, while at the same time advancing preceding package forming blank lengths respectively toward the preforming or body shaping mechanism, the shear mechanism, and the folding and delivery plunger blade means respectively. As the foil passing from the supply moves over the idler guide roller 41, it traverses the beam of light projected thereon from the light service 150, whereby the light beam is reflected from the foil surface to the electric eye device 149, thereby activating the latter to produce an output of electrical energy, which through proper agencies (not shown), supplies current to maintain the solenoid 138 energized so long as the electric eye device continues to be activated. Since the power transmitting cycle of the Geneva gearing 121—122 is so determined as to produce operative movement of the feed rollers 34—35 which is somewhat short of that required to feed the full length of foil re-

quired to provide a package forming blank, when said Geneva gearing comes to rest, the auxiliary drive cam 37, by its operation, is timed to produce outswinging movement of the rocker arms 135 and 136, with consequent outward movement of the reciprocable bar 134 and solenoid 138 carried by the latter. Since, at the time outward movement thereof is initiated, the solenoid 138 is energized, its armature 139 is strongly held retracted, and consequently the solenoid functions in the character of an electric clutch, whereby the link 147 is operatively coupled to the reciprocable bar 134 so as to participate in its outward movement. The outward movement of the link 147 swings outward the lever 144, the movement thereof being transmitted through the pawl 149 and ratchet wheel 143 to the drive worm 142, and through the latter to the worm gear 146, thus imparting rotary movement to the drum or casing 123 and ring gear 124 of the planetary gear set. Since the Geneva driven shaft 120 and planet gear frame 125 affixed thereto have previously come to rest and remain immovable, the rotation of the ring gear 124 produces rotary movement of the planet gears 126 about their axes, which in turn is transmitted to the drive gear 128, to transmit therethrough a continued foil feeding movement of the feed rollers 34—35.

Under the operation of the described auxiliary drive means, the feeding movement of the foil continues until a detector spot or patch 133 thereon intersects the beam of light from the light source 150. The spot or patch 133, being of a comparatively dark color, is substantially non-light reflective, and consequently its registration with the light beam serves to instantly cut off transmission of activating light to the electric eye device 149, thus immediately interrupting the output of electrical energy from the latter, and consequently, by the action of thereby controlled associated agencies (not shown), likewise immediately interrupting the supply of energizing current to the solenoid 138. Immediately the solenoid 138 is de-energized, the armature 139 thereof is released from magnetic attraction, and consequently the electric clutching or coupling effect between the reciprocable bar 134 and link 147 is broken, so that further outward movement of the former is no longer transmitted to the latter, and therefore motion of the planetary gear set ceases and feeding movement of the feed rollers 34—35 is completed and stopped. During the period of dwell following a foil feeding operation, the cam 139 operates to return the auxiliary drive devices to normal initial positions, ready for a repetition of its above described functions during succeeding foil feeding operation as timed and initiated by the Geneva gearing 121—122.

Owing to the fact that the detector spots or patches 133 are imprinted on the foil in exact spaced relation whereby the intervals are equivalent to the exact length of foil required to form a package blank, and since said spots or patches 133 also bear an exact predetermined relation to the label imprints with which the foil is provided, it will be obvious that not only will each feeding operation of the feed rollers 34—35 advance proper lengths of foil, but also the label imprints will always occupy corresponding and proper predetermined positions with respect to the boundaries of each package forming length of foil.

Attention is here called to the fact that the cam shaft 58 of the package body preforming or shaping mechanism is driven by a sprocket and chain transmission 151, the drive sprocket 152 of which is fixed on and actuated by said counter shaft 112.

It will be understood that in embodiments of the instant invention whereby the packages are to be made from plain, i. e. unprinted foil, or other sheet material, the above-described auxiliary feed drive mechanism may be omitted, and the feed rollers 34—35 driven and timed solely by the Geneva gearing transmission means.

It will be understood that in embodiments of the instant invention whereby flat envelope like packages are desired to be produced, i. e. packages without preformed side walls, then the above-described package body preforming or shaping mechanism may be omitted.

Package side closure seam forming mechanisms

Ranged along the course of the conveyer mechanism outgoing from the location of the foil feeding and delivering mechanism are the means for forming the side closure seams of the produced packages. Such side seam forming means comprises various mechanisms located at successively spaced stations relative to which the upstanding folded package blanks, as carried by the gripper devices of the conveyer mechanism, are caused to dwell by the intermittent progress of said conveyer mechanism.

After an upstanding folded package blank is deposited in and engaged by a gripper device of the conveyer mechanism, an advancing movement of said conveyer mechanism first carries the same to and brings it to rest at a station and in position to be operated upon by a side seam scoring mechanism (see Figs. 1 and 8 to 12 inclusive).

The side seam scoring mechanism comprises a carrier block 153 having at the front thereof a perpendicular outwardly open recess bounded by side wings 154. Said carrier block 153 is provided with a pair of slide bars 155 which extend rearwardly from the back thereof. Said slide bars are mounted for reciprocation in a supporting standard 156 which rises from a bridging bracket 157 affixed between the rails 3. Extending through said carrier block and into the slide bars 155 thereof are slideway bores 158, to slidably receive the supporting studs 159 of a female scoring block 160, so as to dispose the latter within said recess of the carrier block 153. Compression springs 161 are mounted within said slideway bores 158 behind the supporting studs 159, so as to yieldably thrust said female scoring block 160 to an outwardly projected position, as determined by stop means 162, in which position the operative front face of said female scoring block is normally projected slightly beyond the front ends of the recess bounding side wings 154 of said carrier block. At its front face, said female scoring block 160 is provided, adjacent to each side thereof, with sets of perpendicular, laterally spaced, scoring grooves 163. Intermediate said sets of scoring grooves 163 is an open recess 164 to provide clearance for a shaped body wall of the preformed package blank operated upon. The means for operatively reciprocating the carrier block 153, and the female scoring block 160 yieldably supported thereby, comprises a suitably fulcrumed lever means, the upper arm 165 of which is operatively coupled with the carrier block slide bars 155, while the lower arm 166 of which is connected by a connecting rod 167 of an

actuating eccentric 168 driven by the lay shaft 166.

Arranged to cooperate with said female scoring block 160 is a male scoring block 169 having a tail-piece 170 extending outwardly from the back thereof. Said tail-piece 170 is mounted for reciprocation in a supporting standard 171 which rises from a bracket 172 affixed to one of the rails 3. At its front face, said male scoring block 169 is provided, adjacent to each side thereof, with sets of perpendicular, laterally spaced, scoring tongues 173. Intermediate said sets of scoring tongues is an open recess 174 to provide clearance for a shaped body wall of the preformed package blank operated upon. The means for operatively reciprocating the male scoring block 169 comprises a suitably fulcrumed lever means, one arm 175 of which is operatively coupled with the tail-piece 170, while the other arm 176 of which cooperates with an actuating cam 177 driven by the lay shaft 80.

Normally, the male and female scoring block devices are respectively retracted to an initial separated relation as shown in Fig. 10, and while they are so disposed, an operative movement of the conveyer mechanism moves forward and brings to rest a gripper device carrying an upstanding folded package blank, so as to position the latter operatively between the retracted scoring block devices. During the period of dwell of the conveyer mechanism, the actuating eccentric 168, by its timing operation, moves forward the carrier block 15 and female scoring block 160 carried thereby, while the actuating cam 177, by its timing operation, likewise moves forward the male scoring block 169, with the result that said male and female scoring blocks are moved together so as to engage by and between the respective scoring tongues 173 of the one and the cooperating scoring grooves 163 of the other, the superposed side marginal portions of the interposed upstanding folded package blank, thereby impressing in such marginal portions suitably formed and spaced scores which are calculated to define lines about which subsequently effected closure seam folds are to be turned (see Fig. 11). As the male scoring block 169 engages the female scoring block 160, the latter will yieldingly retreat, against the tension of the springs 161, into the recess of the carrier block 153, with the effect of advancing the side wings 154 relative to the meeting faces of the male and female scoring blocks. Such relative advance of said side wings 154 causes the same to engage freely projecting sections of the side marginal portions of the folded package blank, which extend beyond the outermost score lines, so as to turn the same angularly outward approximately ninety degrees, thus effecting an initial stage of a first side seam lap folding operation (see Fig. 12).

Upon completion of the scoring and initial stage folding operations above described, the scoring block devices are retracted by their actuating and timing means, whereupon the conveyer mechanism is timed to again advance to thereby carry the scored package blank onward and bring into position a succeeding package blank to be scored by a repetition of the above described operations.

The advance movement or movements of the conveyer mechanism carries the scored package blank to and brings it to rest at a station and in position to be operated upon by a first side seam lap folding mechanism (see Figs. 1 and 13 to 15 inclusive).

The side seam lap folding mechanism comprises a stationary outer head frame 178 supported by a standard bracket 179 from a bracket shelf 180 affixed to one of the rails 3. This head frame 178 is provided with spaced sets of vertically opposed bearing members 181 in which are journaled vertical rock shafts 182. Affixed to each rock shaft 182 is a carrier member 183, upon the free end of which is affixed an anvil plate 184 having, along its perpendicular free margin, a beveled anvil element 185. Affixed to the upper ends of said rock shafts 182 are lever arms 186. Affixed to and rising from said bracket shelf 180 are forked standards 187 by which are supported slideway bars 188 disposed transverse to the conveyer mechanism. Mounted for reciprocation on said slideway bars 188 is a carriage 189 which is provided with an upstanding tail-block 190. Interconnected between said tail-block 190 and the respective lever arms 186 are links 191. The means for effecting properly timed reciprocation of said carriage 189 comprises an actuating cam 192 driven by said lay shaft 80. This cam 192 cooperates with an actuating lever 193 which is suitably fulcrumed at its lower end in connection with the bed-plate 1, and the upper end of which is operatively coupled by a link 194 to said carriage 189.

Supported by a standard bracket 195, rising from a bridging bracket structure 196 affixed between the rails 3, is an inner head frame 197. This inner head frame 197 is provided with vertically opposed bearing members 198 in which are journaled vertical rock shafts 199. Affixed on each rock shaft 199 is a carrier member 200, upon the free end of which is affixed a folder blade 201. Said carrier members 200 are suitably shaped so that their intermediate portions cross one another. Secured to the upper ends of the rock shafts 199 are lever arms 202, the same having upstanding anti-friction rollers 203 mounted at their free end portions. Also supported from said bridging bracket structure 196 are upstanding bearing posts 204, and journaled in and between said posts is an overhead cam shaft 205 upon which is mounted a cam roll 206. Said cam roll is provided in connection with its opposite lateral peripheries with indented cam sections 207, which are respectively cooperative with the rollers 203 of said lever arms 202. An interconnecting pull spring 208, which extends between the lever arms 202, yieldably retains the rollers 203 of said lever arms in operative engagement with the cam roll 206. Said cam shaft 205 is driven from the lay shaft 80 by a sprocket and chain transmission 209. Affixed to and rising from the bridging bracket structure 196 are forked standards 210 by which are supported slideway bars 211 disposed transverse to the conveyer mechanism. Mounted for reciprocation on said slideway bars 211 is a carriage 212. Supported by said carriage 212 is a forwardly projecting carriage arm 213 having a bifurcated outer end portion adapted to straddle the crossed intermediate portions of said carrier members 200. Affixed to the bifurcate outer end of said carriage arm 213 is a backer block 214 having, suitably formed and located on its operative face, perpendicular clearance grooves 215 to accommodate inner scores of a package blank, and an intermediate clearance recess 216 to accommodate a shaped body wall of the preformed package blank operated upon. The means for effecting properly timed reciprocation of the carriage 212 and backer block 214 carried thereby

comprises an actuating cam 217, which is also driven by said lay shaft 80. Said cam 217 cooperates with the forked end plate 218 of a connecting rod 218', the opposite end of which is connected with the lower arm 219 of a suitably fulcrumed lever, the upper arm 220 of which is connected with the carriage 212 by a link 221.

Normally, carriage 189 is retracted to draw back the link connections 191 and lever arms 186 so as to swing back the anvil carrier members 183, as shown in Fig. 14. Normally, the carriage 212 is likewise retracted to draw back the backer block 214, while the cam roll 206 is effective upon the lever arms 202 to swing back the folder blade carrier members 200, as is also shown in Fig. 14. While these parts occupy such retracted positions, the conveyer mechanism operates to advance and bring to rest the previously scored package blank, with its partially turned seam laps, into position to be operated upon by said parts. In operation, the backer block 214 is first advanced to back up the package blank, whereupon the actuating and timing cam 192 operates through the lever 193 to advance the carriage 189, the forward movement of the latter being transmitted through the links 191 to the lever arms 186 so as to swing forward the anvil carrier members 183. The resultant forward swinging movement of the anvil plates 184 causes their beveled anvil elements 185 to respectively clamp, against the backer plate 214, the superposed side marginal portions of the package blank along areas within and bordering the outermost scores and behind the out-turned first side seam laps, while at the same time disposing the anvil plates in acute angular relation to the face plane of the package blank, as shown in Fig. 15. As soon as the anvil plates 184 are thus operatively disposed, the rotating cam roll 206 carries its indented cam sections 207 in opposition to the rollers 203 of the lever arms 202, thus permitting the spring 208 to swing the latter to in turn swing forward the folder blade carrier members 200. The resultant forward swinging movement of the folder blades 201 causes the same to engage the out-turned first side seam laps so as to bend or fold the same inwardly against the anvil plates 184, and thus to positions acutely angular to the face plane of the package blank, as shown by the broken line delineation of said folder blade means appearing in Fig. 15.

Upon completion of the in-folding of the first side seam laps, the folder and associated devices are returned to normal initial positions by the means which actuate and time their operations, whereupon the conveyer mechanism advances the treated package blank onward and brings into position a succeeding package blank for repetition of the described folding operations.

The advance movement of the conveyer mechanism carries the treated package blank to and brings it to rest at a station and in position to be operated upon by a final first side seam lap folding means (see Figs. 1, 16 and 17).

This final lap folding means comprises an outer folder block 222, which is mounted on and actuated by the reciprocable carriage 189, and an inner folder block 223, which is mounted on and actuated by the reciprocable carriage 212. Said outer folder 222 is provided, in its operative face and intermediate its sides, with a clearance recess 224 to accommodate the outer shaped body wall of the preformed package blank operated upon, and, in like manner, the operative face of said inner folder block 223 is provided with a similar recess 225 to accommodate the inner shaped body wall of said blank. The operative face of said inner folder block 223 is also provided, between its sides and said recess 225, with clearance grooves 226 to accommodate the inner scores of the package blank.

Normally, the folder blocks 222 and 223 are retracted to initial separated relation, as shown in Fig. 16, and while they are so disposed, the conveyer mechanism brings to rest therebetween the package blank to be operated upon thereby. By the timed advances of the carriages 189 and 212, said folder blocks 222 and 223 are moved together so as to engage, between the operative portions thereof, the partially infolded first side seam laps, thereby pressing the same flatly down to finally folded home condition, as shown in Fig. 17, after which said blocks are again retracted to normal initial separated relation.

In the herein described illustrative embodiment of the instant invention, the package produced is provided with twice folded or lapped side seam closures. To produce the second seam laps, mechanisms for initiating, in-folding and pressing home the same relative to the second or inwardly disposed scores of the package blank are successively stationed along the out-going course of the conveyer mechanism. These mechanisms correspond in general structure and mode of operation to those already described for producing the first laps. These mechanisms are shown in Fig. 1, and comprise the second lap initiating folding means, generally indicated by the reference character 227, which is similar in form and function to the scoring block mechanisms with the scoring elements omitted and produces the second lap folding effect shown in Fig. 18; the second lap in-folding means, generally indicated by the reference character 228, which is similar to the folding mechanism of Figs. 13 to 15 inclusive, and which produces the second lap folding offset shown in Fig. 19; and the final second lap flat folding and pressing blocks, generally indicated by the reference character 229, which is similar to folder blocks shown in Figs. 16 and 17, and which produces the second lap final folding effect shown in Fig. 20.

It will be obvious that in some types of packages, single lap side seam closures may be adequate for the purposes for which the packages are to be used; in such case therefore the second lap producing mechanisms above referred to may be omitted.

For some uses, it is desirable that the package be impervious to air and moisture, and to attain such condition it is desirable that the portions of the closure seams be sealed against tendency to open at any point. In such case surfaces of the foil which meet when forming the closure seams are coated with a substance adapted, on application of heat, to strongly adhere and seal such surfaces together. There are lacquers and similar coating substances which will fuse and adhere under heat application, and which may therefore be employed for sealing effects. When such coated foil is used to obtain air and moisture proof sealed closure seams, the machine is provided with means for applying sealing heat to said closure seams. In the instant embodiment of this invention, a sealing mechanism is provided for operation upon the package side closure seams (see Figs. 1 and 23), the same comprising inner and outer sealer blocks 230 and 231, imbedded in each of which are electrical heating units 232.

Said sealer blocks are mounted for reciprocable movement toward and away from each other, and to this end each sealer block is provided with a tail-piece **233** extending rearwardly from the back thereof. Affixed to the rails **3**, to extend transversely thereof, is a bracket bar **234** upon which are supported fulcruming members **235** for pivotally mounting sets of parallelly related upstanding rocker arms **236** and **237**, one set thereof being disposed to serve the inner sealer block **230** and the other set thereof being disposed to serve the outer sealer block **231**, and to this end having their upper ends pivotally connected to the tail-pieces **233** of said sealer blocks. Each set of rocker arms includes a dependent actuating lever **238**. The means for producing oscillation of said rocker arms operative to effect timed in and out relative movements of said sealer blocks comprises an oscillator member which is affixed to a rock shaft **239** supported by a suitable bearing post **240** rising from the bed-plate **1**. The upper arm **241** of said oscillator member is connected by a link **242** to the actuating lever **238** which serves the rocker arms of the inner sealer block **230**, while the lower arm **243** of said oscillator member is connected by a link **244** to the actuating lever **238** which serves the rocker arms of the outer sealer block **231**. Timed oscillation of said oscillator member is effected by means of an actuating cam **245** mounted on the lay shaft **80**. Said cam **245** cooperates with the forked end plate **246** of a connecting rod **247**, the opposite end of which is connected with a rocking lever arm **248** which is affixed to the rock shaft **239** of said oscillator member.

Normally, the sealer blocks **230—231** are respectively retracted to an initial separated relation so that a side seamed package may be carried by the conveyer mechanism to and brought to rest therebetween. During the period of dwell of the side seamed package intermediate said sealer blocks, the actuating mechanism serving the latter, by its timing operation, moves the sealer blocks together, so as to engage and press the formed side seam closures of the package therebetween. When the sealer blocks are thus in contact with said side seam closures, the heat of said blocks is transmitted to the coated foil of which the side seams are composed so as to fuse the coating substance with the described sealing effect. After the side seam closures are thus sealed, the timed actuation of the sealer blocks again retracts the same to normal initial separated relation, and the conveyer mechanism operates to advance the treated package for further operations.

Prior to sealing the side seam closures of the package, it is of advantage to slightly spread the top open end of the package to facilitate entrance thereinto of package mouth expanding means to be subsequently described. Means to accomplish such preliminary spreading comprises opposed suction members (see Figs. 1, 21 and 22), which are formed by conduits or pipes **249**. Said conduits or pipes **249** are affixed by offsetting supporting brackets **250** to the tail-pieces **233** of the respective sealer blocks **230** and **231**, so that the suction members are reciprocated by the same mechanism which reciprocates said sealer blocks. The conduits or pipes **249** are connected in communication with an air exhaust pump (not shown), the suction effect of which upon the suction members is suitably timed and controlled by automatic valve mechanism (not shown). The free end portions of said suction members are opposed, preferably at the same station where the seam closure pressing blocks **229** are located, the top ends of the latter being notched, as at **251**, to accommodate said suction members so that, when operatively moved together, the suction mouths **252** thereof will be brought into engagement with the respective face walls of the package, at points immediately below the top open end thereof, and while the side closure seams thereof are undergoing flattening pressure by said pressing blocks **229** (see Fig. 21). When such contact of the suction mouths **252** with the package face walls is made, the suction control valve mechanism will operate to establish communication between the exhaust pump and said suction members, whereby the package walls will be gripped by suction thereto. The gripping suction will be maintained during a desired portion of the retractive or separating movement of the suction members, whereby the top marginal portions of the package mouth will be slightly spread apart (see Fig. 22), after which the suction effect is cut off so as to release the package mouth when so spread.

The means for expanding the package mouth subject to submission of the package to a filling operation, comprises vertically reciprocable spreading wedge means (see Figs. 1, 24 and 25). Preferably said spreading wedge means is so arranged as to produce the expanding operation in two successive stages, respectively carried on at two different stations of dwell of the package as intermittently advanced by the conveyer mechanism, preferably at a first station in advance of the sealer block station, and at a second station beyond the sealer block station. As thus arranged the spreading wedge means comprises a perpendicular slideway bar **253** suitably affixed to and rising from the bed-plate **1**. Slidable on said slideway bar **253** is a vertically reciprocable slide block **254**. Affixed to said slide block **254** is a downwardly offset carrier frame **255** which underpasses the sealer block mechanism to a point adjacent to a station at which the first stage of the package mouth expanding operation is desired to be carried on. At this point, said carrier frame **255** is provided with an upstanding post **256** having at a horizontal arm **257** extended from its upper end, and attached to and dependent from said arm **257** is a first spreading wedge **258**, which is in the form of an inverted cone of relatively small diameter, and which is aligned with and above the top end of a package supported by the conveyer mechanism. Also affixed to said slide block **254** is a top carrier arm **259** having an inwardly offset end portion to which is affixed a second spreading wedge **260**, which is also in the form of an inverted cone but of comparatively larger diameter, and which is aligned with and above the top end of a package supported by the conveyer mechanism at a station beyond the sealer block mechanism.

Means for producing properly timed reciprocation of the slide block **254** and the spreading wedges supported therefrom, comprises an actuating lever **261** which is pivotally mounted on a fulcrum post **262** affixed to the bed-plate **1**, and disposed to extend transversely across the latter. Interconnected between the forward end of said lever **261** and said slide block **254** is a link **263**. The rearward end of said lever **261** is provided with a roller **264** to engage an actuating and timing cam **265** by which the lever **261** is oscillated, to produce operative reciprocation of said slide block **254** and the spreading wedges supported

therefrom. Said cam 265 is mounted on the lay shaft 106. A suitable anchored spring means 266 yieldably maintains the lever 261 under the control of said cam 265. Timed downward movement of said first spreading wedge 258 causes the same to enter the mouth of a package operated on so as to partially expand the same, while, after said package is moved into alignment therewith, timed downward movement of said second spreading wedge 260 causes the final expansion of the package mouth to desired open condition ready for subjection to package filling means.

While a means for expanding the package mouth by a two-stage operation has been described as preferable in many cases, there are other cases in which such expanding operation may be adequately performed in a single operation by means of a suitably stationed single vertically reciprocable spreading cone or similar agency. In the latter cases, it will be obvious that the second spreading cone may be omitted from the mechanism.

Package filling mechanism

After the open package has been completed by the agencies and in the manner above described, the conveyer mechanism will advance the same to a station at which the desired content to be enclosed therein is introduced thereinto. In the illustrative embodiment of the invention as shown and described, the filling station is located beyond the turn of the conveyer and at a point along the return course thereof which parallels the lay shaft 106.

One form of filling mechanism adapted to control delivery of granular material is shown in Figs. 1, 26, 27 and 28, and comprises spaced supporting standards 267 which are affixed to and rise from the bed-plate 1 outwardly of the return course of the conveyer mechanism. Supported by and between said standards 267 is an inverted conical hopper 268 in which is carried a supply of material from which the packages are charged. Located between and aligned with the lower discharge end of said hopper 268 is a suitably supported transverse channeled slideway 269 in which reciprocates a material transport and measuring bar 270. Provided in said bar 270 is a vertically open measuring pocket 271 sized to hold that volume of material desired to constitute a package charge. Timed reciprocation of said bar 270 moves its measuring pocket back and forth between the discharge end of said hopper and a point above and substantially aligned vertically with a position of dwell to which the package is advanced by the conveyer mechanism for filling.

The means for effecting properly timed reciprocation of said material transport and measuring bar 270, comprises a slidable carriage bar 272, which is slidably supported by the arms 273 of a frame structure connected with the standards 267. Said carriage bar 272 is disposed in offset relation to and exteriorly of the lower portion of the hopper 268. Affixed to the inner end of said carriage bar 272 is a laterally projecting inner carrier bracket 274, and spaced outwardly therefrom, and adjustably movable on the carriage bar, is laterally projecting outer carrier bracket 275. The transport and measuring bar 270 is rigidly affixed to the outer carrier bracket 275 and adjustably fixed to the inner carrier bracket 274. The means for longitudinally adjusting the transport and measuring bar 270 relative to the carriage bar 272 by which it is reciprocated, comprises an adjusting screw 276 rotatably mounted in an upstanding lug 277 with which the inner end of said transport and measuring bar 270 is provided. Said adjusting screw is threaded into said inner carrier bracket 274. By turning said adjusting screw 276, the transport and measuring bar 270 may be longitudinally shifted so as to bring its measuring pocket 271 into accurate register with the discharge end of the hopper, when said transport and measuring bar is retracted to loading position.

The means for effecting properly timed reciprocable movements of the transport and measuring bar 270, comprises a pivoted lever mechanism carried on a rock-shaft 278 journaled in a bearing support 279 which is affixed to a rail 3. Said lever mechanism includes an upwardly extending lever arm 280, the free end of which is coupled by a link 281 to a knuckle 282 dependent from said inner carrier bracket 274, and a downwardly extending lever arm 283 having a roller stud 284 which engages a race cam 285, by which timed oscillation of the lever mechanism is produced. Said cam 285 is mounted on and rotated by the lay shaft 106.

Fulcrumed on a shaft 286 supported by the standards 267 is a pivoted vertically oscillatable carrier arm 287 which is provided at its free end portion with a yoke 288 to embrace and support a funnel member 289 so that the same may be raised and lowered at proper times. The means for producing properly timed rise and fall of said funnel member 289 comprises an actuating cam 290, which is affixed on and driven by said lay shaft 106. Said cam 290 cooperates with the forked end plate 291 of a connecting rod 292, the opposite end of which is connected with said pivoted carrier arm 287.

Means are provided for positively ejecting at proper times from the measuring pocket 271 of the transport and measuring bar 270, the material transported thereby from the hopper to the filling funnel member 289. This means comprises a vertically oscillatable ejector arm 293 carried by a rock shaft 294 which is journaled in a suitably supported stationary bearing bracket 295. Also affixed to said rock shaft 294 is a crank arm 296 having a laterally projecting roller stud 297 at its free end portion. Affixed to said inner carrier bracket 274 of the carriage bar, so as to be reciprocated therewith, is a cam plate 298 provided with a suitably shaped cam slot or race 299 in which said roller stud 297 of the crank arm 296 is operatively engaged.

The hopper 268 is provided with means to agitate its content, so as to assure proper discharge flow of said content therefrom at all times (see Figs. 1 and 26). This agitating means comprises an overhead frame bar 300 which is mounted between the upper end portions of the standards 267. Affixed to this frame bar, in alignment with the vertical axis of the hopper 268, is bearing means 301 in which is journaled a vertical shaft 302 disposed to extend centrally downward within the interior of said hopper. Affixed to the lower end of said shaft 302 is a conical deflector member 303. This deflector member serves both to support the weight of the hopper content above the discharge end of said hopper, while at the same time, by its rotation, operating to assure flow of material past the same. Also affixed to the shaft 302 by radial supporting arms 304, and thus so as to be revolved around the hopper interior adjacent to the hopper walls, is an agita-

tor blade 305. The combined effect of said deflector member and agitator blade is to maintain the hopper content fluent and free from tendency to compact itself or bridge across the lower constricted end portion of the hopper with choking or flow retarding effect. The means for driving the shaf 302 and its described associated devices, comprises a counter shaft 306 supported in bearings 307. Said counter shaft 306 drives said shaft 392 by intermediate intermeshing bevel gears 308 and 309 respectively fixed on said respective shafts. Said counter shaft 306 is in turn driven from said lay shaft 106 by a vertical transmission shaft 310. The upper end of said transmission shaft 310 is connected with the outer end of said counter shaft 306 by intermediate intermeshing bevel gears 311 and 312 respectively fixed on said respective shafts. Said lay shaft 106 is connected with the lower end of said transmission shaft 310 by intermediate intermeshing bevel gears 313 and 314 respectively fixed on said respective shafts.

In the operation of the filling mechanism, the transport and measuring bar 270 is normally outwardly retracted to position its measuring pocket 271 beneath the discharge mouth of the hopper 268, so as to be loaded by gravitation of material from the latter, while the funnel member 289 is moved to initial raised position (all as shown in Fig. 28). While the filling mechanism is in this normal initial condition, the conveyer mechanism brings to rest beneath the funnel member 289 a package to be filled, whereupon the timed actuation of said funnel member causes the same to descend so that its discharge end enters into the mouth of the conveyer supported package (see Fig. 27). The funnel member having been operatively positioned relative to the package to be filled, the timed actuation of the transport and measuring bar 270 slides the same forward to project its loaded measuring pocket 271 beyond the inner end of the slideway 269 and above the open mouth of the funnel member, whereby the measured charge of material carried by said pocket 271 may fall therefrom into said funnel member so as to flow therethrough and be guided thereby into the awaiting package (see Fig. 27). In order to assure discharge of material from the measuring pocket 271, as the carriage bar 272 and inner carrier bracket 274 moves forward with the transport and measuring bar, the cam plate 298 is also moved forward to cause its cam slot or race 299 to ride along the roller stud 297 of the crank arm 296, thus rocking the rock shaft 294 so as to swing down the ejector arm 293, whereby the angular plunger portion 293' carried by its free end, is thrust downwardly through the measuring pocket so as to dislodge the material carried therein (see Fig. 27).

After the above described filling operations are completed, the various actuated devices are returned to normal initial positions, whereupon the conveyer mechanism is timed to again advance to thereby carry on the filled package and bring into filling position a succeeding package to be filled by a repetition of the above described operations.

Package end closure seam forming mechanisms

Ranged along the return course of the conveyer mechanism, beyond the location of the package filling mechanism, are the means for closing the open ends of the filled packages by forming end closure seams. Such end closure seam forming means, as in the case of the side closure seam forming means previously described, also comprises various mechanisms located at successively spaced stations relative to which the filled packages, as still carried by the gripper devices of the conveyer mechanism, are caused to dwell by the intermittent progress of said conveyer mechanism.

In the production of an end closure seam therefor, the filled package is first submitted to the action of an end seam scoring mechanism, associated with which is a package mouth closing means disposed and adapted to act in advance of the score forming devices thereof (see Figs. 1, 29, 30 and 31).

The end seam scoring mechanism comprises an inwardly projecting bearing bracket 315 which is mounted on one of the standards 267 beyond the hopper 268. Dependent from said bearing bracket 315 is a stationary male scoring block 316, which is disposed exteriorly adjacent to the path of movement of the top end of the filled package as carried by the conveyer mechanism. Journaled in said bearing bracket 315 is a rock shaft 317 upon which is fixed a dependent carrier frame 318 adapted to be oscillated by said rock shaft. The lower outer end portion of said carrier frame 318 is provided with a forwardly projecting seam lap turning nose 319 which, at proper times, cooperates with the top surface 316' of said male scoring block 316. Slidably supported in connection with the lower end of said carrier frame 318, and so as to move relative to said lap turning nose 319, is a female scoring block 320. This female scoring block is yieldably urged by spring means 321 to a forwardly thrust position, whereby an operative face is normally approximately aligned with the front face of said lap turning nose 319. The means for producing properly timed oscillatory movements of said carrier frame 318 and the female scoring block carried thereby, comprises an actuating cam 322 mounted on and driven by said lay shaft 106. Said cam 322 cooperates with the forked end plate 323 of a connecting rod 324, the opposite end of which is connected with a crank arm 325 affixed to said rock shaft 317.

The means for closing the package mouth preliminary to the end closure seam scoring operation (see Fig. 29), comprises an inner presser arm 326 which is affixed to said carrier frame to project therefrom for disposition in operative relation to a filled package dwell station in advance of the station at which the scoring operation is performed. Cooperative with said inner presser arm 326 is an oscillatable outer presser arm 327. This outer presser arm 327 is carried by a second rock shaft 328, lying above and parallel to said rock shaft 317, and which is journaled in a bearing means 329 supported from said main bearing bracket 315. Said second rock shaft 328 is actuated by said first rock shaft 317 by means of intermediate intermeshing gears 330 and 331 respectively fixed on said respective rock shafts. Normally said inner and outer presser arms 326 and 327 stand swung apart until a filled package is advanced and brought to rest therebetween, whereupon, while a further advanced package is undergoing a scoring operation, the mouth of said first mentioned package is closed, by the inswinging movement of the inner presser arm 326, which accompanies inswinging movement of the carrier frame 318, and by the inswinging movement of the outer presser

arm 327, which is occasioned by the rocking movement inparted to its rock shaft 328 by the operation of the carrier frame rock shaft 317.

Normally, the carrier frame 318 and the female scoring block 320 carried thereby stand swung back (see Fig. 30), until a filled package is advanced and brought to rest between the same and the stationary male scoring block 316, whereupon the cam 322, by its timing operation, swings forward said carrier frame 318, thereby carrying forward the operative face of the female scoring block 320 so as to engage between the same and the operative face of said male scoring block 316, the closed marginal top end portions of the interposed filled package. By such engagement a suitably positioned transverse score is impressed in the package material. After the scoring blocks 316—320 meet, the carrier frame 318 continues its forward swing movement, the female scoring block 320 yielding thereto, whereby the nose 319 engages the freely projecting section of the package end, which extends beyond the top surface 316' of said male scoring block, so as to turn the same angularly outward approximately ninety degrees thus effecting an initial stage of a first end seam lap folding operation (see Figs. 31 and 36).

Upon completion of the described scoring and initial lap folding operations, the carrier frame and female scoring block are swung back to normal initial positions, whereupon a succeeding filled package is brought up for scoring, while the scored package is advanced for further end closure seam forming operations, the first of which is performed by a first end seam lap folding mechanism (see Figs. 1, 32 and 33).

The first end seam lap folding mechanism comprises bearing standards 332 which rise from a bracket shelf 333 affixed to and projecting outwardly from a rail 3. Journaled in connection with said bearing standards 332 is a rock shaft 334. Affixed to said rock shaft is an oscillatable carrier member 335, upon the free end of which is secured an anvil plate 336 having, along its upwardly projecting free margin, a beveled anvil element 337. Said carrier member 335, and its anvil means, is disposed so as to swing upwardly and inwardly toward the path of movement of the top end of a filled package as supported by the conveyer mechanism subject to its action. Secured to said rock shaft 334 is an upwardly and outwardly inclined lever arm 338, by which rocking motion is imparted thereto.

Supported by bracket frames 339 extending from said bearing standards 332 is a stationary backer member 340 having, suitably formed and located on its operative face, a horizontal clearance groove 341 to accommodate the score with which the package end is provided. Said backer member 340 is disposed inwardly adjacent to the path of movement of the top end of the filled package as carried by the conveyer mechanism.

Pivotally mounted on said rock shaft 334 as a fulcrum is a carrier member 342, upon the free end of which is secured a folder blade 343. Said carrier member 342, and its folder blade, is disposed to swing downwardly and outwardly toward the path of movement of the top end of a filled package as supported by the conveyer mechanism subject to its action. Said carrier member 342 is provided with an upwardly and outwardly inclined lever arm 344, by which oscillatory movement is imparted thereto.

Journaled in connection with said bearing standards 332, in a position outwardly of and parallel to said rock shaft 334, is a cam shaft 345. Fixed on said cam shaft is an anvil carrier member actuating cam 346 adapted to engage a roller stud 347 with which the lever arm 338 is provided. A suitably anchored spring means 348 maintains the lever arm 338 and its roller stud 347 under the control of said cam 346. Also fixed on said cam shaft 345 is a folder blade carrier member actuating cam 349 adapted to engage a roller stud 350 with which the lever arm 344 is provided. A suitably anchored spring means 351 maintains said lever arm 344 and its roller stud 350 under the control of said cam 349. The means for effecting properly timed operation of said cam shaft 345 and the cams 346 and 349 thereof comprises an actuating cam 352, which is mounted on and driven by the lay shaft 106. Said cam 352 cooperates with the forked end plate 353 of a connecting rod 354, the opposite end of which is connected with an actuating lever arm 355 with which said cam shaft 345 is provided.

Normally, the anvil carrier member 335 and the folder blade carrier member 342 occupy initial swung apart positions (see Fig. 32) so that the conveyer mechanism may advance and bring to rest the filled package to be operated upon. When at rest, the upper end of the package, with its partially turned seam lap, is backed by the backer member 340, whereupon the timed actuation of the cam shaft 345 rotates the cams 346 and 349 in a clockwise direction. The rotating cam 346, by the resultant shifting of its high part away from the roller stud of the lever arm 338, allows the latter to swing down under the pull of the spring means 348, thus rocking the rock shaft 334 to swing up the anvil means carrier member 335. The upward swing of said carrier member 335 carries upwardly and inwardly the anvil plate 336 so as to bring the beveled anvil element 337 in position to clamp against the backer member 340 the upper marginal portions of the package end along areas beneath the out-turned first end seam lap, while at the same time disposing the anvil plate in acute angular relation to the face plane of the package (see Fig. 33). As soon as the anvil plate is thus operatively positioned, the rotating cam 349, by the resultant shifting of its high part into engagement with the roller stud 350 of the lever arm 344, swings upwardly the latter, whereby said folder blade carrier member 342 is swung downward about said rock shaft 334 as a fulcrum. The downward swing of said carrier member 342 carries downward and outward the folder blade 343, thereby causing the same to engage the out-turned first end seam lap so as to bend or fold the same about the edge of the anvil element and against the inclined anvil plate, whereby said lap is further turned to an acutely angular relation to the face plane of the package (see Figs. 33 and 37).

Upon completion of the infolding of the first end seam lap, the described folder devices are returned to normal initial positions, whereupon the package is advanced to the next station where means are located for pressing home said lap. This lap pressing means is, in the illustrative embodiment of the invention as shown, operated by and in conjunction with end seam sealing means, and comprises a stationary presser member 356 and a movable presser member 357 (see Fig. 34). When the movable presser member 357 is swung toward the stationary presser member 356, the partially infolded first end seam

lap, disposed therebetween, is engaged and pressed flatly down to finally folded home condition (see Fig. 38).

In the illustrative embodiment of the invention as shown, provision is made for producing a twice folded or lapped end seam closure; and to this end, at a station intermediate the location of the presser members **356—357** and the end seam sealing means subsequently described, is located (at point *x*, Fig. 1) a second set of lap turning or folding means comprising cooperating anvil carrier means and folded plate carrier means like those above described and shown in Figs. 32 and 33, the same being adapted to form and turn a second seam lap as shown in Fig. 39. The cooperating anvil carrier means and folder plate carrier means of said second set thereof, are controlled by the same actuating mechanism whereby the first described set thereof is operated. It will be obvious that should it be desired to form a package closed by a single lap and seam closure rather than a twice folded or lapped seam closure, then said second set of lap turning or folding means may be omitted.

As explained above, when a hermetically sealed package is desired, means must be provided for sealing the end closure seam as well as the side closure seams. The means shown (see Fig. 35) as operative to seal the end closure seam comprises, a bearing standard **358** which rises from a bracket shelf **359** affixed to and projecting outwardly from a rail 3. Supported from said bearing standard **358**, by a bracket frame **360**, is a stationary sealer block **361**. Said stationary sealer block is disposed inwardly adjacent to the path of movement of the top ends of the filled packages as carried by the conveyer mechanism. Journaled in said bearing standard **358** is a rock shaft **362** upon which is fixed a dependent carrier arm **363**. Mounted on said carrier arm **363** is a movable sealer block **364**. Imbedded in each sealer block **361** and **364** is a suitable electrical heater element **365**. The means for effecting timed actuation of said movable sealer block carrier arm **363** comprises, a cam **366** which is mounted on and driven by said lay shaft **106**. Said cam **366** cooperates with the forked end plate **367** of a connecting rod **368**, the opposite end of which is connected with an actuating lever arm **369** with which said rock shaft **362** is provided. When a package is aligned with and between the sealer blocks **361** and **364**, the movable sealer block is swung toward the stationary block by the operation of said timing and actuating means, whereby the turned and angularly disposed seam lap is pressed flatly home, to the position shown in Fig. 40, and at the same time the heat of said blocks is transmitted to the coated foil portions of the formed end closure seam so as to fuse the coating substance with desired sealing effect, after which the sealer blocks resume normal initial separated relation, and the resulting filled, closed and sealed package may thereupon be advanced by the conveyer mechanism to a point of discharge from the machine.

Package discharging mechanism

The filled, closed and sealed package is advanced by the conveyer mechanism to a discharge station at which is located mechanism for automatically ejecting the same from the machine (see Figs. 41 and 42). Mounted on the bedplate 1, outwardly of the return course of the conveyer mechanism, are upstanding spaced standards **370**. Extending outwardly from said standards **370** is the supporting framework **371** for an endless discharge belt **372**. Journaled in and between said standards **370** is a drive shaft **373** upon which is mounted the driving pulley **374** of said discharge belt. The outer end of said discharge belt is supported by an idler pulley **375** mounted in connection with the outer end portion of said framework **371**. Said shaft **373** is driven from the lay shaft **106** by intermediate intermeshing gears **376** and **377** respectively fixed on said respective shafts.

Supported by a standard **370** is an inwardly extending frame bar **378**, and supported from the latter is a chute **379** adapted to receive a package released from a gripper device of the conveyer mechanism, and thereupon guide said package onto the outgoing course of the discharge belt **372**.

Means is provided for opening the package holding gripper device so as to release the package for delivery to the discharge belt. This gripper device opening means comprises, a pivoted gripper trip lever, the upper arm **380** of which is disposed to engage the actuating lever **16** of the movable gripper jaw **15**, while the lower arm **381** of said trip lever is operatively engaged by a cam **382** which is mounted on and driven by said lay shaft **106**.

Means is also provided for lifting the package out of the opened gripper device and transferring the same to the receiving end of the chute **379**. This means comprises an oscillatable ejector plate **383** fulcrumed on a pivoting stud **384** which is carried by said frame bar **378**. The free end portion of said ejector plate **383** is suitably notched to straddle the gripper jaws **14—15**. Extending from the hub of said ejector plate **383** is an actuating lever arm **385** therefor. The means for effecting timed operation of said ejector plate **383** comprises a rock-shaft **386** journaled in and between said standards **370**. Affixed to said rock shaft **386** is an upwardly projecting lever arm **387**, the free end of which is connected with the free end of said ejector plate actuating lever arm **385** by a link **388**. Mounted on and driven by the shaft **373** is an ejector plate timing and actuating cam **389** which cooperates with the stud roller **390** of a rock shaft actuating lever **391**. Spring means **392** maintains the ejector plate actuating means under and subject to the control of said cam **389**.

In the operation of the ejector plate mechanism, after a package is brought to rest by the conveyer mechanism subject to the effect thereof, the cam **382**, by its timing operation upon lever arm **381**, swings inward the lever arm **380** into operating engagement with the movable gripper jaw actuating lever **16**, thereby swinging the movable gripper jaw into separated or open relation to the stationary gripper jaw **14** (see Fig. 42). Simultaneously with the opening of the gripper device, thus accomplished, the ejector plate **383** is upswung by its timing and actuating means so as to engage the bottom end of the package, and as the latter is released by the opened gripper device, to thereupon lift the package upwardly so as to carry its bottom end to the receiving end of the chute **379**. During such movement of the package its upper end portion passes between a rear stop plate **393**, which holds the same against backward displacement, and a stop bar **394**, projecting from the frame bar structure **378**, which retains the same against falling forward. When the ejector plate **383**,

by its upswinging movement, raises the lower end of the package to the level of the chute 379, the package will slide, bottom end forward, into and down through the chute, and will be thus deposited upon the out moving course of the discharge belt 372, by which it is carried away and thus discharged from the machine.

After a package has been thus discharged, the ejector mechanism, and associated means for opening the gripper device of the conveyer mechanism, are caused to resume normal initial condition, while the conveyer mechanism again advances to bring up for discharge a succeeding package, whereupon the discharge operations above described are repeated.

It will be obvious that many changes could be made in the various mechanisms and devices making up the machine above described and as shown in the accompanying drawings, and that many apparently widely different embodiments of the features of this invention could be made without departing from the scope thereof as defined in the following claims. It is therefore intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a machine of the kind described, in combination, an intermittently actuated endless conveyer mechanism having spaced gripper devices, a reciprocable plunger blade and cooperating material guide means, means to supply predetermined lengths of sheet material relative to said plunger blade and guide means subject to be engaged and folded upon itself into a package blank by operative movement of the blade through said guide means and then delivered thereby to an awaiting gripper device of said conveyer mechanism positioned to receive the same, means operating in timed relation to said plunger blade to open the awaiting gripper device for the reception of the folded package blank and then close the same for holding said blank subject to transport by said conveyer mechanism, and means stationed along said conveyer mechanism at points of dwell thereof adapted to manipulate side marginal portions of said blank to form therefrom side closure seams to thereby produce a package having an upper open end.

2. In a machine of the kind described, in combination, an intermittently actuated endless conveyer mechanism having spaced gripper devices, a reciprocable plunger blade and cooperating material guide means, means to supply predetermined lengths of sheet material relative to said plunger blade and guide means subject to be engaged and folded upon itself into a package blank by operative movement of the blade through said guide means and then delivered thereby to an awaiting gripper device of said conveyer mechanism positioned to receive the same, means operating in timed relation to said plunger blade to open the awaiting gripper device for the reception of the folded package blank and then close the same for holding said blank subject to transport by said conveyer mechanism, means stationed along said conveyer mechanism at points of dwell thereof adapted to manipulate marginal portions of said folded blank to form therefrom closure seams to convert the blank into a package, means to discharge the package from the machine, and means operating in timed relation to said discharge means for opening the package supporting gripper device to release said package.

3. In a machine of the kind described, timed cooperating feed rollers for drawing sheet material from a supply roll and advancing the same to provide lengths thereof from which packages are to be formed, means to preform predetermined areas of an advanced length to produce concavo-convex formation thereof adapted to bound the interior hollow space of the package ultimately formed from said length, means to sever a preformed length from the run of the supplied sheet material, a reciprocable plunger blade and cooperating material guide means relative to which the severed preformed length is delivered subject to be engaged and folded upon itself by operative movement of said blade through said guide means, to thereby produce a package blank ready to be subjected to package forming manipulation.

4. In a machine of the kind described, timed cooperating feed rollers for drawing sheet material from a supply roll and advancing the same to provide lengths thereof from which packages are to be formed, means to preform predetermined areas of an advanced length to produce concavo-convex formation thereof adapted to bound the interior hollow space of the package ultimately formed from said length, means to sever a preformed length from the run of the supplied sheet material, an intermittently actuated endless conveyer mechanism having spaced gripper devices, a reciprocable plunger blade and cooperating material guide means relative to which the severed preformed length is delivered subject to be engaged and folded upon itself into a package blank by operative movement of said blade through said guide means and then delivered thereby to an awaiting gripper device of said conveyer mechanism positioned to receive the same, means operating in timed relation to said plunger blade to open the awaiting gripper device for the reception of the package blank and then close the same for holding said blank subject to transport by said conveyer mechanism, and means stationed along said conveyer mechanism at points of dwell thereof adapted to manipulate side marginal portions of said blank to form therefrom side closure seams to thereby produce a package having an upper open end.

5. In a machine of the kind described, timed cooperating feed rollers for drawing sheet material from a supply roll and advancing the same to provide lengths thereof from which packages are to be formed, means to preform predetermined areas of an advanced length, to produce concavo-convex formation thereof adapted to bound the interior hollow space of the package ultimately formed from said length, means to sever a preformed length from the run of the supplied sheet material, an intermittently actuated endless conveyer mechanism having spaced gripper devices, a reciprocable plunger blade and cooperating material guide means relative to which the severed preformed length is delivered subject to be engaged and folded upon itself into a package blank by operative movement of said blade through said guide means and then delivered thereby to an awaiting gripper device of said conveyer mechanism positioned to receive the same, means operating in timed relation to said plunger blade to open the awaiting gripper device for the reception of the package blank and then close the same for holding said blank subject to transport by said conveyer mechanism,

means stationed along said conveyer machanism at points of dwell thereof adapted to manipulate marginal portions of said folded blank to form therefrom closure seams to convert the blank into a package, means to discharge the package from the machine, and means operating in timed relation to said discharge means for opening the package supporting gripper device to release said package.

6. In a machine of the kind described as defined by claim 2, wherein means are provided, at suitably located conveyer dwell stations, respectively adapted to heat seal the package forming closure seams.

7. In a machine of the kind described as defined by claim 5, wherein means are provided, at suitably located conveyer dwell stations, respectively adapted to heat seal the package forming closure seams.

8. In a machine of the kind described, timed cooperating feed rollers for drawing sheet material from a supply roll and advancing the same to provide lengths thereof from which packages are to be formed, means to preform predetermined areas of an advanced length of said material to produce concavo-convex formation thereof adapted to bound the interior hollow space of the package ultimately formed therefrom, said latter means comprising a stationary block having reciprocable male stretcher means, a female stretcher block normally separated from said stationary block to admit the sheet material therebetween, said blocks having means to clamp margins of the interposed sheet material therebetween when said blocks are in meeting relation, driven cam means to control movement of said female block into meeting relation to said stationary block, and additional driven cam means to thereupon control movement of said male stretcher means relative to said female stretcher block with preforming effect upon the interposed material, means to sever a preformed length of material advanced beyond said preforming means, a reciprocable plunger blade and cooperating material guide means relative to which the severed preformed length of material is delivered subject to be engaged and folded upon itself by operative movement of said blade through said guide means, to thereby produce a package blank ready to be subjected to package forming manipulation.

9. In a machine of the kind described, timed cooperating feed rollers for drawing sheet material from a supply roll and advancing the same to provide lengths thereof from which packages are to be formed, means to preform predetermined areas of an advanced length of said material to produce concavo-convex formation thereof adapted to bound the interior hollow space of the package ultimately formed therefrom, said latter means comprising a stationary block having reciprocable male stretcher means, a female stretcher block normally separated from said stationary block to admit the sheet material therebetween, said blocks having means to clamp margins of the interposed sheet material therebetween when said blocks are in meeting relation, driven cam means to control movement of said female block into meeting relation to said stationary block, and additional driven cam means to thereupon control movement of said male stretcher means relative to said female stretcher block with preforming effect upon the interposed material, means to sever a preformed length of material advanced beyond said preforming means, an intermittently actuated endless conveyer mechanism having spaced gripper devices, a reciprocable plunger blade and cooperating material guide means relative to which the severed preformed length of material is delivered subject to be engaged and folded upon itself into a package blank by operative movement of said blade through said guide means and then delivered thereby to awaiting gripper device of said conveyer mechanism positioned to receive the same, means operating in timed relation to said plunger blade to open the awaiting gripper device for the reception of the package blank and then close the same for holding said blank subject to transport by said conveyer mechanism, and means stationed along said conveyer mechanism at points of dwell thereof adapted to manipulate side marginal portions of said blank to form therefrom side closure seams to thereby produce a package having an upper open end.

10. In a machine of the kind described, timed cooperating feed rollers for drawing sheet material from a supply roll and advancing the same to provide lengths thereof from which packages are to be formed, means to preform predetermined areas of an advanced length of said material to produce concavo-convex formation thereof adapted to bound the interior hollow space of the package ultimately formed therefrom, said latter means comprising a stationary block having reciprocable male stretcher means, a female stretcher block normally separated from said stationary block to admit the sheet material therebetween, said blocks having means to clamp margins of the interposed sheet material therebetween when said blocks are in meeting relation, driven cam means to control movement of said female block into meeting relation to said stationary block, and additional driven cam means to thereupon control movement of said male stretcher means relative to said female stretcher block with preforming effect upon the interposed material, means to sever a preformed length of material advanced beyond said preforming means, an intermittently actuated endless conveyer mechanism having spaced gripper devices, a reciprocable plunger blade and cooperating material guide means relative to which the severed preformed length of material is delivered subject to be engaged and folded upon itself into a package blank by operative movement of said blade through said guide means and then delivered thereby to an awaiting gripper device of said conveyer mechanism positioned to receive the same, means operating in timed relation to said plunger blade to open the awaiting gripper device for the reception of the package blank and then close the same for holding said blank subject to transport by said conveyer mechanism, means stationed along said conveyer mechanism at points of dwell thereof adapted to manipulate marginal portions of said folded blank to form therefrom closure seams to convert the blank into a package, means to discharge the package from the machine, and means operating in timed relation to said discharge means for opening the package supporting gripper device to release said package.

11. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported

blank to form a package therefrom, comprising means to turn, fold back and press home laps of said marginal portions into closure seam formation.

12. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to score said marginal portions to define foldable seam forming laps, and means to turn, fold back and press home said laps into closure seam formation.

13. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to turn, fold back and press home laps of said marginal portions into closure seam formation, and means to heat seal the closure seam formation thus provided.

14. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to score said marginal portions to define foldable seam forming laps, means to turn, fold back and press home said laps into closure seam formation, and means to heat seal the closure seam formation thus provided.

15. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to back the package blank, oscillatable anvil plate means cooperative with said backing means to hold the blank material along a line of fold about which a seam forming lap is to be turned, oscillatable folder means cooperative with said anvil plate means to turn said lap, and means to press home the turned lap.

16. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to back the package blank, oscillatable anvil plate means cooperative with said backing means to hold the blank material along a line of fold about which a seam forming lap is to be turned, oscillatable folder means cooperative with said anvil plate means to turn said lap, means to press home the turned lap, and means to heat seal the resultant closure seam formation thus obtained.

17. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to score said marginal portions to define foldable seam forming laps, means to back the thus scored blank, oscillatable anvil plate means cooperative with said backing means to hold the blank material subject to folding thereof about lap defining scores, oscillatable folder means cooperative with said anvil plate means to turn the laps, and means to press home the turned laps.

18. In a machine of the kind described, an intermittently actuated endless conveyer having spaced gripper devices each adapted to support a package blank provided by sheet material folded upon itself, and means stationed along said conveyer at points of dwell thereof adapted to manipulate marginal portions of a supported blank to form a package therefrom, comprising means to score said marginal portions to define foldable seam forming laps, means to back the thus scored blank, oscillatable anvile plate means cooperative with said backing means to hold the blank material subject to folding thereof about lap defining scores, oscillatable folder means cooperative with said anvil plate means to turn the laps, means to press home the turned laps, and means to heat seal the resultant closure seam formations thus obtained.

19. In a machine of the kind described as defined in claim 2, wherein said package discharge means comprises outgoing means to convey the packages away from the machine, and means, timed to operate upon opening of a gripper device to release a package for discharge, adapted to deliver the released package to said outgoing conveying means.

20. In a machine of the kind described as defined in claim 2, wherein said package discharge means comprises an outgoing driven conveyer belt to receive discharged packages, a chute means to guide packages onto said belt, and means, timed to operate upon opening of a gripper device to release a package for discharge, adapted to deliver the released package onto said chute means.

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